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2.
Awarded Grand Prize, Paris Exposition, 1900.

PROGRESSIVE MEDICINE.

A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES,
AND IMPROVEMENTS

IN THE

MEDICAL AND SURGICAL SCIENCES.

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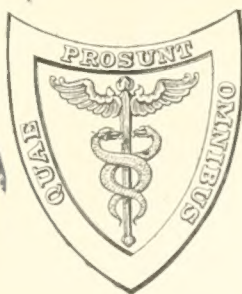
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SURGERY OF THE ABDOMEN, INCLUDING HERNIA—GYNECOLOGY—
DISEASES OF THE BLOOD AND DUCTLESS GLANDS. THE
HEMORRHAGIC DISEASES. METABOLIC
DISEASES—OPHTHALMOLOGY.



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PROGRESSIVE MEDICINE.

JUNE, 1902.

SURGERY OF THE ABDOMEN, INCLUDING HERNIA.

BY WILLIAM B. COLEY, M.D.

PENETRATING SHOT WOUNDS OF THE ABDOMEN.

THE profession is gradually turning to the surgeons of New Orleans for instruction as to the best methods of treating gunshot wounds of the abdomen, for no other city in the world, apparently, is able to furnish such rich material.

Fenner¹ reports 6 cases of penetrating wounds of the abdomen operated upon by himself and subjected to abdominal section. In addition to these valuable personal statistics he has also reported the complete statistics of the New Orleans Charity Hospital from January, 1892, when operative treatment was first attempted, to January, 1901.

During the period stated laparotomy was performed for penetrating wounds of the abdomen at the Charity Hospital of New Orleans 152 times, with 87 deaths, giving a mortality for all cases of 57.23 per cent.

Of the 152 cases mentioned 113 were for gunshot wounds, with 78 deaths, or a mortality of 69 per cent.

These figures vary but little from the statistics of Morton, of 1899, who cited 110 cases, with a mortality of 62 per cent., and Coley's statistics of 1890, which cover 165 cases, with a mortality of 67.2 per cent.

Fenner has very wisely separated the stab wounds from the gunshot wounds, and in 39 cases there were 9 deaths, or a mortality of 23.7 per cent. He further grouped the operations according to the different years :

In 1892 there were 9 gunshot wounds; 5 died = 55.55 per cent.					
" 1893	"	10	"	6	" 60 "
" 1895	"	13	"	10	" 76.9 "
" 1896	"	24	"	16	" 66.66 "
" 1897	"	15	"	13	" 86.66 "

¹ Annals of Surgery, January, 1902, p. 15.

Fenner makes another important classification, including only cases in which there were lesions of the viscera. This table shows 105 cases of gunshot wounds and stab wounds of the abdomen operated upon, with visceral injuries, of which 74 died, being a total mortality of 70.47 per cent. Of these 105 cases 96 were gunshot wounds, of which 71 died, giving a mortality of 73.95 per cent. ; 9 were stab wounds, of which 3 died, being a mortality of 33.33 per cent.

Of Fenner's personal cases, 6 in number, one was a gunshot wound of the diaphragm, spleen, stomach, and liver, necessitating splenectomy, suture of the diaphragm, stomach, and liver ; the patient recovered. The fact that this patient's life was saved was probably due largely to the operation having been performed almost immediately after the injury. The patient, aged twenty-seven years, was brought to the hospital in an ambulance ; he was immediately prepared and median laparotomy performed. A large quantity of blood was found in the upper abdomen ; a large wound was found in the spleen, which necessitated its removal. The bullet, after hitting the liver, had struck back and was found in the gastrocolic omentum.

Another case worthy of special note was a gunshot wound of the left hip, with eight perforations of the intestine, with laparotomy, enterorrhaphy, and recovery.

Here, again, recovery was doubtless due to the promptness with which laparotomy was performed. The patient was brought in an ambulance and operated upon immediately.

A third case of gunshot wound of the right buttock, with penetration of the abdomen, one perforation of the bowel, and one of the bladder, was treated by laparotomy, enterorrhaphy, and suture of the bladder, followed by recovery. The patient was brought to the hospital in an ambulance, and laparotomy was performed at once.

The fourth case was a gunshot wound of the left hip, with perforations of the intestine ; laparotomy, enterorrhaphy, with recovery. The patient was a negro, aged twenty-seven years. He was brought to the hospital in an ambulance, and immediate operation was performed. The patient made an uneventful recovery.

The fifth case was an incised wound of the abdomen, with escape of the intestine. The patient, a white child, aged four years, while walking down some steps, carrying a glass, fell, shattering the glass, pieces of which entered the abdomen through the rectus muscle, inflicting such an extensive wound that one and a half feet of the intestine escaped. The child was brought to the hospital in an ambulance, and immediate operation was performed. No lesion of the viscera could be detected ; after thorough flushing the wound was closed. The patient had an uneventful convalescence.

The sixth case is that of a gunshot wound of the thorax, penetrating the abdomen and wounding the diaphragm, spleen, stomach, and liver. Splenectomy, suture of the diaphragm, stomach, and liver. Immediate operation was performed. This case also was a negro, aged twenty-seven years. The bullet had entered through the thorax, on a level of the tenth rib and axillary line; there was a large amount of blood in the abdomen, and some stomach contents had also escaped. The spleen was so badly wounded as to necessitate removal. Shock was very great, but was overcome by large doses of stimulants. The patient was discharged, perfectly cured, at the end of twenty-one days.

It is interesting to note that in this case no drainage was employed, although from the character of the wound and the escape of the contents of the stomach into the abdomen one would say that the indication for drainage existed, if ever called for in gunshot wounds of the abdomen.

A study of these six cases shows that drainage was employed only in one case, and in this the apparent indication was a wounded bladder. Certainly such a record in gunshot wounds of the abdomen entitles Dr. Fenner's opinions to great respect. He states that he is impressed by the fact that one can never tell from general symptoms or external appearances whether the viscera have been wounded or not. He believes in thorough examination of every portion of the intestine, citing as an example of such necessity a case of stab wound in which the symptoms of the patient led him to believe that there was no visceral injury, and he was inclined not to operate. He finally decided to open the wound and examine only three to four feet of the bowel nearest the wound, and finding no injury he sewed up the incision. The patient did well for two days, when he suddenly became worse, and died in two hours, of severe peritonitis. Autopsy showed a clear cut through the bowel just beyond the point where his inspection had stopped. He believes that every penetrating wound of the abdomen should be given the benefit of an operation if the case is seen in time. He cites another case showing the importance of operation even where there is no visceral injury. The patient had been shot about the pubis thirty-six hours before admission to the hospital, and peritonitis had already developed. No operation was performed. Autopsy showed no injury of the viscera, but a bullet was found lying in the pelvis together with some fragments of bone from the pubis, and the whole abdomen was the seat of severe septic peritonitis.

Although the general mortality of operations for gunshot wounds of the abdomen with visceral injuries is still very high—73.95 per cent.—Fenner believes that the 26 per cent. of recoveries owe their lives to the operation, and that a death-rate of 33.33 per cent. in stab wounds

with injured bowels means that two-thirds were saved from death by operation.

H. Mohr's¹ article represents a very valuable contribution to the subject of gunshot wounds of the abdomen. He states that abdominal shot wounds constituted 3.3 per cent. of all injuries in the Civil War, with a mortality of 90 per cent. ; 5.8 per cent. in the Franco-Prussian war in 1870-71. Thirty per cent. of all shot wounds of the abdomen were penetrating, with a mortality of 69 per cent. One-third of the deaths from penetrating wounds occurred within the first three days after injury. The mortality in the war between China and Japan was 70 per cent. ; in the Tonquinese war, 78 per cent. All these figures refer to wounds inflicted by weapons of large calibre and treated almost exclusively without operation.

While formerly isolated injuries to the skin and musculature of the abdomen were frequent, with modern weapons nearly all shots penetrate the abdomen. Of 92 abdominal injuries among the Japanese 45 were non-perforative, according to Haga.

In reviewing the experience with shot wounds of the abdomen during the late wars as compared with injuries during peace, a very prominent feature is the large number of spontaneous cures that have been observed, especially in the Spanish-American war and in the war with the Boers. (Senn, Alverrhe, Treves, Hildebrandt, and others.) Senn saw spontaneous cures, especially in the cases where the bullet entered in the umbilical region or in one of the iliac fossæ. In view of the surprisingly large percentage of spontaneous cures, Küttner is reported as having expressed his opinion that abdominal shot wound cases die when operated upon and recover when left alone. Frequently even in case of proved intestinal perforation no serious symptoms were noted. (Treves, MacCormac.)

Of 92 cases of abdominal shot wounds, partially penetrating wounds, observed during the Japanese war 40 died immediately upon the battle-field—in all 73 per cent. Nearly all cases with visceral injuries succumbed, also three that were operated upon.

The course of injuries caused by large calibre and lead bullets was far more unfavorable than in those due to small-calibre bullets.

It must be remembered, however, Mohr states, that the favorable cases in the Spanish-American and the Boer war represent but a certain percentage of the cases of penetrating shot wounds that really occur ; hence, considered by themselves, they present entirely too favorable a picture. He cites Cheyne's experience at Karee-Siding, where 15 cases of abdominal shot wound came under treatment. When Cheyne arrived,

¹ Archiv f. klin. Chir., vol. lxiii., Nos. 1 and 2.

23 hours later, 5 of the wounded had already died; 4 died within the following 36 hours without operation, 1 with operation. At Paardeberg and Driefontein, Cheyne saw 12 patients, 1 of whom was operated upon without success, and 7 died later without operation. On the other hand, the mortality at the hospital in Cape Town, where only cases that had passed the primary stage were treated, the mortality was but 20 per cent. The cause of death was mainly secondary phenomena, fecal abscess, etc. A large proportion of the serious cases of abdominal shot wounds die on the battle-field—according to Haga, 42 per cent. of all cases of abdominal shot wounds. Mohr believes that with modern weapons of small calibre and greater penetrating power this percentage is, in all probability, higher still.

Mohr's explanation of the remarkably frequent occurrence of spontaneous cures is that cases with extensive destruction and hemorrhage dying, soon after the injury, of shock, acute peritonitis, or bleeding to death, do not receive treatment of any kind, and are to be excluded altogether in the statistics of spontaneous cures. He believes that the spontaneous cures refer to the less serious cases; and that, furthermore, in view of the uncertain and indefinite character of the symptoms of intestinal perforation in the beginning of the disease, it is quite possible that in reality non-perforative cases are reported as perforative cases, with spontaneous cure. In addition to this, experiments as well as autopsies have proven that in rare cases the bullet may traverse the abdominal cavity without injuring the viscera. Klemm in his experiments upon dogs found no visceral injury in 2 out of 32 cases; Lühe, in 3 out of 152 operations; Körte, in 64 operations found the intestine intact in 5 instances, although in these cases the vessels were generally injured, causing serious hemorrhage. According to Grant, no symptoms of intestinal injury were present in 6 per cent. of 400 cases, and in 253 operations neither perforation nor hemorrhage was found in 8 per cent. However, in several instances autopsy later proved that perforations and vesical injuries had been overlooked. Grant reports 3 deaths in 16 operations, during which no intestinal injury was found: 1 was due to a perforation that had been overlooked, the other 2 to infected blood coagula.

With regard to indications for operation, Treves considers the following conditions contraindications: (1) If more than seven hours have elapsed since the injury; (2) if a prolonged and difficult transport was unavoidable; (3) if the injury was received soon after a meal; (4) if the route of the bullet lies above the umbilicus; (5) if the bullet has remained in the body. He further considers operation unnecessary in most cases where the bullet entered the abdomen below the umbilicus, since they recover without intervention (Sehn is

of the same opinion). He considers operation contraindicated also in cases of isolated injury to the ascending or descending colon; and, lastly, in injuries of the liver, kidney, and spleen, which recover under expectant treatment. On the basis of these contraindications the number of those subjected to operative treatment is reduced to a minimum.

MacCormac and Dieut take a similar stand-point, declaring that either the injuries are so serious that the prognosis is bad with or without operation, or they are of such a nature that recovery will take place without consequences to the wounded.

Dieut bases his objection to primary laparotomy mainly on the fact that the time generally elapsing between injury and operation is too long, so that when operation is possible the most favorable time has passed.

The necessity of operative intervention in case of hemorrhage or certain intestinal injury, Mohr states, is generally recognized; opinions differ only as to the time when operation should be undertaken. According to Madelung, expectant treatment should be continued if the condition of the wounded is normal twenty-four hours after receipt of the injury. Others, again, base their argument in favor of immediate exploratory laparotomy on the great uncertainty so often existing in the beginning of these cases. Bonomo considers success probable if operation is done within the first five hours after injury. Mikulicz and König are of the opinion that cases seen more than eighteen hours after receipt of injury are apt to end fatally with or without operation. In operations done more than twenty-four hours after injury, Körte observed but very few cures. In a collection of 25 cases cured by operation within the last few years 7 were operated upon from one to two hours, 7 from two to five hours, only 2 fifteen hours after operation, and in these latter particularly favorable conditions were present.

While the indication for operative intervention must necessarily, in view of the less favorable conditions in war, be more limited than in times of peace, Mohr believes that in one respect it should be extended also on the battle-field, namely, in the presence of suppurative peritonitis. Grant in a series of 120 cases of shot wounds in the abdomen cured by operation reports that distinct peritonitis was found to be present in 11, traces of it in 6 to 8 cases—16 per cent. in all. The results of more active therapy in suppurative peritonitis are relatively very good, even with poor general condition of the patients.

The value of most statistics thus far published, Mohr thinks, is greatly lessened owing to the great dissimilarity of the cases under consideration as a result of difference in weapons and size of calibre. Data with regard to the size, number, and seat of the injuries frequently are missing. Nevertheless, he believes that it will be possible to draw some conclusions from the following table:

MORTALITY TABLE.

I. CASES IN WHICH EXPECTANT TREATMENT WAS EMPLOYED.

(a) *Injuries Received in War.*

	Per cent
Otis, 1864, mortality	90
War report, 1870, 160 cases, one-third of these in the first three days	69
Nimier and Chauvel, Tonquin, 68 cases	78
Haga, Japanese and Chinese war, 47 cases	70
Average in injuries caused by large calibre weapons	76
W. Cheyne, 1899	66
Treves, 1899	40
Makins, 14 cases, 1899	30
Average in injuries caused by small calibre weapons	45.3

(b) *Injuries Received in Peace.*

	Per cent
Andrews	75
Trélat	99
Réclus, 1890	75
Stimson, 37 cases	65
Réclus, 88 cases	25.7
Average	68

II. CASES TREATED BY OPERATION.

(a) *Injuries Received in War.*

	Per cent
Parker, probably including in peace, operated in first seven hours	52
Parker, operated in all stages	64
Grant, 253 cases, collective statistics of American surgeons	52
Grant, 108 cases, operated in all stages	42
Average	52

(b) *Injuries Received in Peace.*

	Per cent
Dalton, 1890, 89 cases, in early operation	61
MacCormac, 1888, 32 cases	71
Réclus, 1890.	78
Stimson	81
Réclus, 102 cases	63
Coley, 40 cases, operated in first twelve hours	55
Coley, 25 cases, operated after twelve hours	77
Coley, 12 cases, operated in all stages	58
Ziegler, 7 cases	50
Winstow, 8 cases	57.5
Pimpinelli, experimental, against 84 per cent. in cases not operated upon	8
Bonomo and Rho, experimental, operated after one to one and a half hour	33
Average	64.3

As regards the cases of injuries received in war and treated expectantly, it appears that since the introduction of small-calibre weapons the mortality has been reduced from 76 to 45 per cent.; this, however, Mohr believes is probably due not only to the difference in weapons, but also to the influence of antiseptics and other factors. On the other hand, in the cases of injury from small-calibre arms during war treated by operation the mortality seems to be slightly higher than for those

treated expectantly—52 per cent. against 45 per cent. Operation here does not yield better results than expectant treatment, even though done early. (Parker.)

As regards the injuries in times of peace, it will be seen that the mortality for the cases treated expectantly is but slightly higher than for those operated upon. Considering, however, Mohr states, that quite a number of these cases were probably non-perforative, and excluding Réclus' mortality of 25 per cent., which cannot possibly be correct, the proportion will be rather different—78 to 64 per cent. Mohr believes that in view of the greatly improved technique and earlier operation as done in recent years the proportion by this time will no doubt have changed still more in favor of operative treatment.

Mohr states that there can be no doubt that the results obtained by operation within the last few years are the best ever achieved in any way. In 48 cases of penetrating shot wounds of the abdomen observed within the last few years, and operated upon within the first four or five hours, there were only 7 deaths—14.5 per cent., or only one-third of the lowest mortality ever obtained without operation. This opinion is strongly borne out by the brilliant results following early operation at the Charity Hospital of New Orleans, and a careful and judicial study of all reported cases must convince one, I think, that in penetrating shot wounds of the abdomen, in civil life at least, operation should always be performed if the patient is seen sufficiently early—*e. g.*, within twelve hours after the injury. The percentage of success will largely depend upon the shortness of the interval between operation and injury.

Le Conte¹ reports a successful case of penetrating gunshot wound of the abdomen treated by laparotomy. The patient was operated upon at the Pennsylvania Hospital between two and one-half to three hours after the injury. The abdomen was tender, distended, and resistant, with tympanites in front and dulness in the flanks. The bullet had entered in the back, three inches to the right of the fifth lumbar spine and on a level with the crest of the ilium. A six-inch median incision was made into the abdomen, and six pints of blood were found in the peritoneal cavity; a large vessel in the mesentery had been severed by the bullet, and there was an opening, one inch long, in the transverse colon, with one perforation of the small intestine. Twenty pints of hot salt solution were used in washing out the abdominal cavity; a glass drainage-tube was left in the wound. A saline infusion of five pints was made during the operation. Strychnine, grain $\frac{1}{30}$, was given every two hours after the operation. At the end of twenty-four hours the

patient was put upon peptonized milk. Forty-eight hours after operation the drainage-tube was removed.

In regard to the proper treatment of penetrating wounds of the abdomen, Le Conte believes that penetrating wounds made by the lead bullet are as fatal to-day as formerly whenever expectant treatment is adopted. On the other hand, wounds made by small-calibre steel bullets on the battle-field have proven less fatal under expectant treatment than when operation has been undertaken. This does not, however, mean that if it were possible to treat such wounds in modern hospitals immediately after they were received, operative treatment would not give better results.

Le Conte believes that whenever the abdomen can be opened with safety, operation should be performed upon every case of penetrating shot wound of the abdomen, no matter what the character of the bullet.

In regard to the important question as to where the incision should be made, Le Conte thinks that this depends upon two factors—the place of entrance and the course the bullet has taken. If the bullet has penetrated outside the semilunar line and at a right angle with the anterior abdominal plane, he believes that the opening should be made in the semilunar line rather than enlarging the wound of entrance. If it has entered on the same plane, but inside the semilunar line, he prefers the median incision.

In the great majority of cases I believe that median incision will give the best access to the wound and save time. It is most important to examine every portion of the intestine before closing the abdomen. Le Conte states that the practice of inflating the intestine by means of hydrogen introduced into the rectum for the purpose of demonstrating a perforation of the bowel is, in his opinion, distinctly bad surgery.

This is the same conclusion that I arrived at in 1891 after a careful review of all the cases in which the method had been employed,¹ and I very strongly discouraged its use and emphasized the disadvantages which Le Conte now again calls to our attention, namely, that it increases fecal extravasation, and so distends the intestines that it may be difficult or impossible to return them into the abdominal cavity until they are emptied of gas. Martin and Hare have shown this to be true. Still more important, it is unreliable as a test of perforation.

In regard to the question of drainage, Le Conte believes that it is the practice to treat the tract of the bullet as septic until it is proved otherwise, and he has always drained such wounds.

I am of the very strong opinion that Le Conte's position is correct. I do not believe that drainage for twenty-four or seventy-two hours is likely to do the slightest harm, and in certain cases I believe it may be

¹ American Journal of the Medical Sciences, 1891.

the means of saving life. I am fully aware that many of the most successful cases, principally those of Fenner, of the Charity Hospital at New Orleans, were obtained where drainage was not used; at the same time the employment of drainage as a routine measure I believe would give the larger proportion of successes.

Wounds Inflicted by Modern Fire-arms. Schjerning, in Langenbeck's *Archiv* (vol. lxiv., No. 1), writes about shot wounds inflicted by modern fire-arms. He states that hitherto the percentage of wounds caused by artillery projectiles has been by far smaller than that resulting from hand fire-arms, but thinks this will be different in future wars. He publishes a table giving the relative frequency of injuries due to hand fire-arms, cannon, etc. :

Year of War.	Nation.	Hand fire-arms.	Artillery.
1854-56 . .	French	51.7 per cent.	41.5 per cent.
1859 . . .	French	91.3 "	5.3 "
1864 . . .	(Prussian	77.5 "	20.2 "
	(Danish	84.0 "	9.1 "
1866 . . .	(Austrian	90.0 "	3.0 "
	(Prussian	79.0 "	16.0 "
	(Bavarian	90.0 "	5.0 "
1870-71 . .	(French	70.0 "	25.9 "
	(German	89.0 "	8.2 "
1877-78 . .	Russian	94.5 "	2.5 "
1894-95 . .	Japanese	90.8 "	7.6 "
1899-1900 .	Boers	78.3 "	21.3 "

With regard to the treatment of abdominal shot wounds, Schjerning thinks there is no doubt that a comparatively large number of cases of abdominal shot wounds have been cured by conservative treatment. Küttner gives the mortality in the Transvaal at 44 per cent., and states that this mortality was reached because, as a rule, operative treatment was desisted from. However, that this figure is too low is proven by Sthamer,¹ who found a mortality of 70 to 75 per cent., and this does not include such cases as died on the field. Schjerning, therefore, doubts the correctness of the course of treating abdominal shot wound cases on an exclusively conservative basis. He inclines to the view that operation should be performed in all cases of perforative shot wounds that come to the surgeon's notice within the first twelve to twenty-four hours after injury, provided laparotomy can be done under fairly secure conditions and without necessitating the patient's removal after operation. It should never be performed on the battle-field.

Schjerning closes by expressing his view that the increasing humanness of wars is due not to the weapons used, but to the increasing knowledge of the physician.

¹ *Munchener med. Wochenschrift*, 1901, No. 15.

Operative vs. Conservative Treatment of Gunshot Wounds. Vincent¹ discusses the question of operative or conservative treatment of perforative gunshot wounds of the abdomen. He cites a paper by Wassilief,² whose statistics show a mortality of 63 per cent. in gunshot wounds with intervention, and 25 per cent. without operation, and a mortality in stab wounds of 24 per cent. in the hands of the laparotomists, 12 per cent. only in the cases treated without operation. He further quotes the statistics of Morton covering 234 cases of laparotomy, with 96 successes and a general mortality of 59 per cent. In gunshot wounds alone the mortality was 67 per cent.; in stab wounds 39 per cent., and in contusions 62 per cent.

Trélat, Berger, and others are in favor of immediate intervention, before peritonitis has had time to develop, and they believe that operation is of little value when done more than fifteen hours after injury.

Wassilief reports 6 cases, in 4 of which operation was performed, with 4 recoveries; 2 cases were treated without operation, with 2 deaths. He concludes without hesitation that it is always better to operate.

Vincent does not think it possible to lay down an absolute rule. He thinks that in gunshot wounds of the abdomen it is wiser to abstain from too hasty operation, on the ground that the possible lesions are *incerta sedis*, and because the perforations may be too numerous to make it possible to suture them all, and, furthermore, because it is possible that peritoneal adhesions may have formed that would prevent the outflow of intestinal fluid. Vincent's argument against early operation could be used with more force and better logic in favor of operation. The very fact that the nature and site of the lesions are uncertain is a strong reason for intervention. Some patients with sixteen perforations of the intestines have recovered by operation, so the possibility of a number of perforations is no contraindication, but an urgent indication for early operation.

In contusions Vincent considers it best, as a rule, to perform laparotomy, inasmuch as the source of the hemorrhage may be found accessible and examination harmless; it may sometimes be possible to successfully operate.

In stab wounds he considers expectant treatment the most advisable.

In wounds caused by sharp instruments, such as a sabre, knife, bayonet, etc., the expectant treatment is likewise preferable when the wounds are so deep that there is reason to fear multiple perforations. At the same time, exploratory laparotomy appears advisable when the perforation seems to be accessible in the stomach, intestine, and liver, and if there is an outflow of gastric or intestinal fluid or bile.

¹ Rev. de Chir., July, 1901.

² *Ibid.*, 1897.

On the other hand, he believes that laparotomy is indicated in the hands of a skilful surgeon thoroughly familiar with antiseptic technique, in the presence of symptoms pointing toward serious internal hemorrhage, the risk of death from laparotomy being less than that of death from the hemorrhage.

Vincent reports three cases : 1. A case of stab wound of the stomach, with suture of the stomach, and cure. 2. Penetrating wound of the abdomen in the region of the right iliac fossa, treated expectantly, with cure. 3. Penetrating wound of the abdomen in the epigastric region, with a large omental hernia. Resection of the omentum after ligature *en masse*, with drainage. Cure.

Vincent takes the ground that it is wiser to cure patients without operation when this is possible, and cites the dictum of Ollier, who says : "The belief that an operation is harmless does not give one the right to perform it."

It does not seem to us that Vincent has produced any real evidence in favor of abstention, and a comparison with the facts brought out by Fenner, based upon a large series of cases treated at the Charity Hospital of New Orleans, cannot but convince the unprejudiced mind that operative interference in the hands of a skilful surgeon, resorted to as soon as possible after the penetrating wound of the abdomen has been observed, will save a far greater proportion of lives than the old *laissez faire* methods of a few years ago.

Multiple Gunshot Wounds of the Abdomen. Martin¹ reports a case of multiple gunshot wounds of the abdomen in which recovery followed operation, although this was not performed until twenty-one hours after the injury was received. There was hemorrhage from the pelvis, which was first controlled, and also an opening in the rectum, which had to be packed with gauze. There was also a hemorrhage from the right lobe of the liver, and a perforation of the gall-bladder and another of the hepatic flexure of the colon. These perforations were sutured and the hemorrhage from the liver controlled by gauze placed above and below the right lobe. Two other perforations were found in the small intestine. During the operation, which lasted nearly two hours, about 1800 c.cm. of normal salt solution were injected into the patient's veins. In spite of this serious operation and an abdominal incision which reached also from the pubes to the costal cartilages, the patient made a good recovery.

Martin insists on an immediate operation in such cases. He says it is a mistake to delay operation because the patient is suffering from shock. Septic peritonitis and hemorrhage are the two chief causes of

¹ Annals of Surgery, March, 1901.

mortality, and their progress produces and continues the shock ; therefore the sooner the operation is undertaken the sooner the cause for shock will be removed. As only 3 or 5 per cent. of gunshot wounds to the peritoneal cavity are uncomplicated by visceral injury, it is wrong to delay surgical intervention until symptoms develop.

TUBERCULOSIS OF THE PERITONEUM.

The Treatment of Tuberculosis of the Peritoneum has been recently very extensively dealt with by Christian Fenger,¹ of Chicago. Fenger divides the history of this disease into three stages, the first dating back to the year 1825, when only sporadic cases of the disease were known and the diagnosis was made with great difficulty. The second stage was from 1825 to 1884, when the disease became better known and was more easily recognized. The third stage began in 1884, when laparotomy for this condition was first proposed by König. Prior to this time the disease was regarded as necessarily fatal. König's paper, written in 1884, gave a report of four cases of tuberculosis of the peritoneum. In this paper he stated that a localized peritoneal exudate should be removed in the same way as an abscess is evacuated in other regions. Three of König's patients recovered and only one died. In 1889 König was able to collect from the literature and from his own cases 131 operations for this condition, the far greater proportion occurring in women, namely, 120 to 11 in men. He also reported the autopsies of 107 cases, 89 of which were women, 18 men, showing an enormous difference in the sexes. This, Fenger believes, can be best explained by the fact that peritoneal tuberculosis is often found in the course of gynecological operations for other conditions, and that it exists as a relatively common and not fatal complication.

One hundred and seven of the cases in König's list left the hospital in satisfactory condition ; 74 were reported cured and 33 improved. König himself, however, was the first to recognize the importance of tracing the patients for a longer period before regarding them as actually cured, and he found that after two or more years had elapsed the proportion of recoveries, which had been recorded as from 60 to 70 per cent., were reduced to 25 per cent. König is unable to explain the successful results following laparotomy, and regarded it as an enigma.

Teleky² has studied the question of the value of internal or non-operative treatment of tuberculous peritonitis more carefully almost than any other writer. A résumé of his paper is given by Fenger.

¹ *Annals of Surgery*, December, 1901.

² *Centralblatt f. d. Grenzgebiete der Medicin und Chir.*, 1899, vol. ii., No. 7.

The common local remedies employed were green soap or mercurial ointment ; for the relief of the intestinal troubles, pain, etc., enemata and opium were given, warm water applications, rest in bed, fresh air and forced feeding, syrup of iodide of iron, cod-liver oil, creasote, arsenic, and painting the abdomen with tincture of iodine were recommended.

After 1884 an important change took place in the views of the profession as to the prognosis of the disease. Nothnagel stated that spontaneous cure may take place. Hilton Fagge believes that spontaneous cures are common in children.

Prior to 1884 all the cases of tuberculosis of the peritoneum in which recovery had taken place were believed to be mistakes in diagnosis. After the treatment of laparotomy was introduced nearly all the authors, up to 1889, reported recoveries in from 70 to 85 per cent. of the cases, but the time of operation was much too short to consider the cases as actually cured.

Von Winckel does not consider a patient has recovered from the disease until he has survived five years.

Cellier reported 71 per cent. of recoveries in 287 cases shortly after operation, but after the patients had been observed for two or more years the percentage fell to 25.

As regards the influence of operation on tuberculosis of the peritoneum it is stated that in the early stages, before the tubercles are fully developed, laparotomy has no effect. If caseation is present laparotomy may check the tuberculous process or cause encapsulation of the tubercles, but the caseous material is not absorbed. All other forms of tuberculosis are retarded in development or brought to histological healing by laparotomy. Gatty deserves special credit for his experimental work done in connection with this question.

Grazer believes that laparotomy should be tried in all cases of tuberculous peritonitis, and Nothnagel thinks it should be done in most cases.

From a clinical stand-point, most authors divide tuberculosis into three classes :

1. The ulcerative or suppurative form ;
- 2, the serous exudate form ;
- 3, the adhesive form.

In the suppurative form cheesy matter predominates in the space between the intestines, and there are small cavities filled with liquefied cheesy pus, a condition similar to that found in tuberculous abscesses in other parts of the body. True, contrary to all other writers, believes that tuberculous abscess in the peritoneal cavity is the only indication for laparotomy, and that puncture is sufficient in the serous cases.

Jaffe advises against operation in the ulcerative form with multiple abscesses, for the reason that breaking down the adhesions renders one liable to tear the friable intestinal wall.

In the form with serous exudate, Teleky states that the good effects of laparotomy are beyond dispute. The percentage of recoveries, from the experience of all authors, is 75 for both children and adults in this form of the disease. The prognosis is better after laparotomy in the serous form without adhesions, and less favorable in the cases with encapsulated exudate.

In the adhesive form of tuberculosis the opinions of most authors as to the effect of laparotomy are exceedingly divergent. While Thomas reports 66 per cent. of recoveries in these cases, Monti says that this form is not suitable for laparotomy, and Jaffe believes that operation is useless and even dangerous.

After careful study of the effects of operation in the different forms, from cases reported in the literature, Teleky concludes that in the ulcerative form an unfavorable operative prognosis must be given. Operation should be employed only as a last resort. In the miliary, serous, exudative form operation is followed by the best results, and is probably always indicated.

In the adhesive form Teleky believes it is hard to give any definite indications for operation, but states that it is probable that operation is advisable when, after prolonged conservative treatment, there is no improvement. In other words, he advises laparotomy because other therapeutic measures have proved of no value.

This conclusion Fenger regards—and I believe rightly—as on a par with the advice to cut, irrespective of results, in other incurable diseases, such as cancer, Hodgkin's disease, or exophthalmic goitre. Fenger believes that the effect of laparotomy as a means of cure in many instances is only apparent, and in spite of seeming recovery, peritoneal tuberculosis progresses.

Operation Technique. As regards the technique of the operation, Teleky gives the following points :

He states that vaginal laparotomy was only done once by Condamin. The abdomen is first opened and the fluid evacuated. The cavity is then dried by sterile sponges. Many surgeons advocate weak antiseptic solutions for irrigation, and Jaffe believes the rubbing with iodoform beneficial. Scheuer advises that a bowel with a tuberculous ulcer should be resected, while others are opposed to this. As a further example of the lack of unanimity among surgeons as to the effects of laparotomy may be cited the opinion of Valenti, who believes that laparotomy cures distant foci, for example, tuberculous lesions of the lung ; while, on the other hand, Monti and Jaffe state that laparotomy is often followed by rekindling of a latent tuberculosis in distant organs. Von Winckel considers drainage superfluous, and most surgeons have closed the wound without drainage, though some insert iodoform gauze drains.

Several series of cases that have been recently reported are mentioned by Fenger. Among these is a series of 41 cases from Czerny's clinic, of which 26.8 per cent. recovered and remained well for three years. The mortality of the operation is exceedingly low, being not more than 1 to 2 per cent. Fecal fistula is an exceedingly frequent complication in the adhesive variety, occurring six times in 19 cases. This, Fenger states, demonstrates how easy it is to injure the intestine in the dry form of tuberculosis in an attempt to loosen the intestines to reach the exudate, and how easily gauze drainage may aid in perforating the bowel and cause a fecal fistula.

While Czerny advises extirpation of the tuberculous adnexa before tuberculous peritonitis sets in, Fenger calls attention to the difficulty of rendering a diagnosis before this period. Fenger believes it possible, however, in a limited number of cases to remove the tuberculous appendix, but when fecal fistula is present he considers an attempt to close it as a thankless task that had much better be left alone.

Czerny reports 8 cases, 3 of which remained cured for three years, and 2 two years later. Three patients died in from two months to a year after operation. Fenger states that these results are just about as good as those obtained without operation. In 1900 the best prognosis for tuberculous peritonitis was 40 to 50 per cent. of cures after operation on the most favorable forms of the disease.

Frank reports 8 cases in which conservative treatment was employed; 3 of these patients were well for three years, 2 after two years, and 3 died.

Fenger believes we must regard tuberculosis as a disease having a tendency toward spontaneous recovery. König and Hegar are of opinion that this tendency is aided by laparotomy; others are inclined to believe that it is produced by the laparotomy itself. The conclusion has been reached that recovery from tuberculosis is due to a combination of effects, as a change in the circulation and abdominal pressure.

Of the 28 cases of tuberculosis observed at the Boston City Hospital, and reported in 1900, Bottomley states that 14 occurred in women and 14 in men. Drainage was employed in 18 cases, with a resulting fecal fistula in 5. Drainage was employed in 10 of 11 fatal cases. In 11 cases in which no drainage was employed only 1 died. It by no means follows that death was the result of the drainage, as drainage may have been employed only in the desperate cases. Bottomley states that local anaesthesia may be used in performing laparotomy.

Immediate improvement was noted in 20 of the 28 cases observed at the Boston City Hospital.

Fenger states that the conclusions to be drawn from cases reported

up to and including 1900 are that a cure may be expected in 30 to 40 per cent. of the cases that heretofore were considered fatal. In the fatal cases the patients die in five to six months after operation.

Fenger states: "After having ploughed through this chaos, out of which it is next to impossible to extricate a ray of light, because reasoning is at a standstill, despite the enormous labor of a multitude of able and indefatigable workers in all countries, one cannot but feel inclined to look for a new departure." And he adds: "It is refreshing at last to find an author (Borchgrevink) who, after the most careful and painstaking labor with all the weapons of modern scientific investigation at his disposal, has the courage to tear down this whole artificial house of cards and make *tabula rasa* of the entire question."

Fenger calls attention to the fact that it is very easy to be deceived in drawing conclusions from one's own limited experience or from a few cases. He believes that Borchgrevink in his excellent paper has brought the subject back to a rational basis by a scientific and careful analysis of two almost equal series of cases of tuberculous peritonitis, the one treated by laparotomy and the other without operation. Of 22 cases of laparotomy, 11 had fever, in the other 11 it was absent. Of the latter, 10 lived, 1 died. Of the 11 with fever, 8 died and 3 only were cured. The forms of peritoneal tuberculosis without fever or with only slight fever, he believes, usually run a favorable course, and laparotomy is unnecessary. In the 11 cases reported with fever, he is convinced that laparotomy did harm in 9, and he does not feel at all sure that the improvement in the other 2 was due to the operation.

Of the 22 cases reported by Borchgrevink 8 were light, 6 moderately severe, and 8 severe. Fourteen of the patients, or 63.6 per cent., recovered, and 8, or 36.4 per cent., died.

Of the 17 cases treated on a conservative basis 14, or 82.3 per cent., recovered, and were still well after two or three years, or were clinically cured and remained well for two or three years. Of the 3 who died death was due in 1 case to tuberculous peritonitis, in a second to intestinal tuberculosis after six months, and in a third to measles.

Borchgrevink's conclusions are that laparotomy in strong patients in whom fever is absent is well tolerated if a condition of good nutrition speaks for a spontaneous disappearance of the tuberculous process.

"Laparotomy, however, in patients with fever, when the tuberculosis has a progressive character, must diminish what slight power of resistance such a patient has remaining. This power of resistance may thus yield, and death follow, or it may, by concurrence of fortunate circumstances, rebound, and the patient recover in spite of the operation.

"That form of peritoneal tuberculosis which exists without, or with only slight fever, runs in itself a favorable course. In such cases laparotomy is unnecessary. In progressive tuberculosis the operation is dangerous, and should be abandoned."

In regard to the advantage of laparotomy over puncture in its effect upon the exudate, Fenger believes there is little to choose. He concludes "that the frightfully disappointing results of the energetic surgical treatment of peritoneal tuberculosis—curetting, excision of tuberculous tumors in the omentum, adhesions, and mesenteric glands—must teach us that nature cures tuberculosis of the peritoneum better than the surgeon."

In reply to the question whether there are any cases of tuberculous peritonitis for which laparotomy is the best method of treatment or the only method, Borchgrevink states that "even the serous tuberculous peritonitis is a territory which surgery must hand back to the internal medicine clinic, with thanks for the splendid opportunity which a misunderstanding gave to the profession, by means of laparotomy, to study tuberculosis in one of the large cavities of the body."

Lauper¹ reports 22 cases observed at the Surgical Clinic, Bern, between 1884 and 1900; 14 were treated by operation, 8 partially by puncture and partially by medicine.

A review of the 22 cases reported shows that 16 were women, 6 men. Although this great discrepancy is probably not altogether due to a greater predisposition to the disease on the part of women—since male cases are preferably consigned to the medical clinic—Lauper nevertheless believes that the female sex, owing to the special behavior of the internal genital organs, is more apt to contract tuberculous peritonitis than the male sex.

As regards the ages of the patients, it is shown that in the majority of the cases the disease occurred between the fifteenth and forty-fifth year, generally in the second half of the second decade. Only 2 cases were below fifteen and 2 above forty-five, and one of the latter had been suffering for six years prior to the more severe onset of the symptoms.

Heredity is a far more important factor in tuberculous peritonitis than it is generally accredited to be. In 9, or 40 per cent. of the cases, a history of tuberculous disease in some member of the family was given. This proportion corresponds pretty nearly to that of Hume, who mentions a heredity of 35 per cent. in his statistics.

During a more or less extended period preceding the acute onset of the symptoms the patients are by no means well, but suffer greatly

¹ Deutsch. Zeitschrift f. Chir., April, 1901.

from general malaise, loss of appetite, lassitude, undefined pain in the abdomen, irregularity as regards movement of bowels. These periods lasted all the way from six months to ten years; in 50 per cent. over a year.

Tuberculous peritonitis, the author states, is certainly not an indolent disease, for over 80 per cent. of the cases observed at the clinic gave a history of violent, spontaneous pain at the time when the disease became acute.

General examination of the patients revealed the presence of tuberculous disease in other parts of the body in 10, or 45 per cent. Vaginal examination showed in 9, or more than one-half of the female cases, fixation of the uterus, parametric changes, and diseased adnexa, principally in the tubes. Rectal examination gave less positive results. Urinary examination showed albumin in 4 cases, and in one-fifth of the cases increase of indican. Tubercle bacilli were found in but one instance. Fever is not as reliable a sign in regard to determining the prognosis as is generally believed; it should never furnish a contraindication to operative intervention.

The operation generally consisted in a longitudinal incision between the umbilicus and symphysis, evacuation of the exudate, irrigation of the cavity with salicylic or physiological saline solution, at times inunction with iodoform, loosening of adhesions at least as far as possible, and, finally, removal of the primary focus of the disease.

In 17, or 78 per cent. of the cases, an exudate was found, usually of serous character, only once hemorrhagic, and once purulent. In 3 cases dry adhesive peritonitis was observed.

These figures correspond pretty closely to those of larger statistics. Frank, for example, found 30 per cent. of adhesive peritonitis.

Six cases, in addition to adhesions, showed distinct tumor formation, resembling the same tumors described by König. These tumors were formed by distended tubes, intestinal adhesions, or encapsulated exudate. The peritoneum was thickened and very sanguineous and tender in 75 per cent. of the cases. In 9 instances pronounced formation of tubercle knots was found.

With regard to the course immediately after operation Lauper states that, in the first place, great reduction in the size of the abdomen is noticed; the patient feels better subjectively, the appetite increases, he gains in weight, and pain ceases or at least decreases in severity. The wound healing was perfect, primary union being obtained in every instance.

With reference to later results, great pains were taken to secure correct data. In 10, or 70 per cent., of the cases operated upon, favorable reports were obtained; 4, or 28 per cent., died within one year after

operation. In 7 of the favorable cases operation was performed from four to sixteen years ago; in 3, less than four years since. In 3 of the unfavorable cases lung complications had set in.

It should be mentioned, Lauper states, that the majority of patients were subjected to internal medication with creasote preparations after operation.

In conclusion, Lauper states that while tuberculous peritonitis is capable of spontaneous cure to a certain degree, the results in the cases treated by operation are far superior, especially when it was possible to remove the primary seat of the disease. Therefore, he continues, laparotomy—which should always have for its object the removal of the primary focus, and which is free from danger if performed within proper limits—is indicated not only in cases of serous exudate, but also in all adhesive forms of the disease in which, often by loosening of the adhesions, the ileus symptoms present are overcome.

Bottomley's¹ elaborate paper, based on a consideration of 28 cases of tuberculous peritonitis observed at the Boston City Hospital, with particular reference to the results of operative treatment, contains much valuable data, and is well worth careful study. Bottomley points out the wide difference of opinion as to the relative frequency of tuberculosis in the peritoneum compared with tuberculosis in other parts of the body, the observations of different writers varying from 1.25 to 16.16 per cent. Nothnagel states that he has found tuberculous peritonitis much more frequent in Vienna than in other places where he has taught, and it is probable that locality has something to do with its relative frequency.

In 1170 autopsies performed at the Boston City Hospital, from January, 1895, to January, 1900, tuberculosis was present in some form in 197 cases, or 16.8 per cent. In 14 of these, 7.1 per cent., the peritoneum was affected. Bottomley states that primary, uncomplicated tuberculous peritonitis is very uncommon. In 226 cases Börschky found it but twice; in the 28 Boston City Hospital autopsies not a single case was observed.

Primary infection, according to Nothnagel, is most frequently found in the lungs. The disease is much more common in women than in men, and 90 per cent. of the reported cases collected by Nothnagel were women; 120 of 134 cases reported by König occurred in women. The autopsy records, on the other hand, seem to show the disease as more common in men, the proportion being 3 to 1. Bottomley believes that the disease is really more common in women.

Only 3 of the Boston City Hospital cases were under the age of ten

¹ American Medicine, February 15, 1902.

In all of the fatal cases death occurred within four months after operation. Hence, Bottomley thinks it fair to consider as recovered a patient well more than a year.

Concerning the proportion of cases in which clinical cure results, Bottomley states that Roersch reports 250 cures in 378 cases, or 70 per cent. Of this number 118 were well for six months, 79 for one year, 52 two years after operation.

Treves, however, is much more conservative, and places the percentage of recoveries at 35 per cent.

König and Wunderlich report from 23 cases 25 per cent. of cures in the ascitic variety and 9.8 per cent. in the adhesive form.

Frees reported 18 cases in which the clinical diagnosis was verified by microscopical examination, with 33 per cent. of cures, and Hirschfeld, in a similar series of 28 cases, reports 62 per cent. of recoveries; here, however, cases well six months were regarded as cures, which is probably too short a period.

Of the Boston City Hospital cases 11 recovered and 11 died, 2 were improved, and 4 could not be traced. Of 19 patients of the ascitic type, 8 (or 42 per cent.) recovered, 7 died, 1 was improved, and 3 could not be traced. Bottomley does not believe that tapping in these cases does very much good, it having been tried in 6 of his cases, and in every instance the fluid reaccumulated in a few days. Bottomley's conclusions are: that we may reasonably expect cures to follow operation in from 30 to 40 per cent. of all cases; that operation usually affords at least temporary improvement, local or general, even in cases that may die later on; that the use of drainage should be avoided when possible.

The question of the relative value of operative treatment compared with medical treatment is not touched upon by Bottomley, the assumption being that in the cases that were cured recovery was entirely due to operation.

Medical Treatment of Tuberculous Peritonitis. Further evidence of the value of medical treatment in tuberculous peritonitis is brought out by I. Burney Yeo, of London,¹ who describes three cases which made excellent recoveries without operation. He states that the results that have of late years been obtained in the treatment of tuberculosis afford much cause for congratulation and satisfaction to the representatives of modern medicine. As late as 1894 Dieulafoy wrote of this disease: "Death is almost always the consequence; a cure is, however, possible."

Yeo believes that at the present time over 50 per cent. of these

¹ Lancet, March 16, 1901.

cases recover, and there seems to be good reason to hope that, when modern methods of treatment are better known and earlier applied, still more favorable results will follow.

The treatment advocated and carried out by Yeo in the cases reported was directed (1) toward allaying the pain and catarrhal irritation of the bowels; (2) toward combating, if possible, the tuberculous infection. For this purpose he gave a mixture containing 15 grains of salicylate of bismuth, 15 minims of the spirit of chloroform, and $\frac{1}{2}$ drachm of compound tincture of cardamom with mucilage and water, and put the patient upon a milk diet. In addition, he applied opium and iodine liniment to the abdomen, and in order to influence the tuberculous infection he ordered a mixture of equal parts of iodoform ointment and cod-liver oil, to be rubbed in freely over the abdominal surface twice daily. At the end of a week he discontinued the bismuth mixture and gave the patient a pill containing $\frac{1}{4}$ grain of iodoform and $\frac{1}{2}$ minim of creasote, three times a day. At the end of a month there was very marked improvement. He then put the patient upon solid food in the shape of eggs, custard, or fish.

Yeo believes that one of the most important points in the medical treatment of tuberculous peritonitis is perseverance in the local application of iodoform ointment and cod-liver oil, which was continued uninterruptedly in the above-mentioned case from June 17th to September 21st—more than three months. Together with the improvement in the abdominal lesions, the fluid disappeared from the right pleural cavity, and there were no longer any abnormal signs about the chest in one of his cases, and the weight of the child improved from sixty-eight pounds to ninety-two pounds.

Yeo believes that the best results are obtained in the early stages, when there is always more or less ascitic fluid in the peritoneal cavity. In the later stages of the disease, when there are numerous adhesions and matting together of the intestines, conditions are unfavorable both for surgical and medical treatment. He believes that, while medical treatment cannot be begun too early, it is possible to operate too early. He thinks, with Watson Cheyne,¹ that operations done too early are often followed by recurrences. The latter's estimate of a reasonable time for carrying out medical treatment is four to six weeks in acute cases; four to six months in chronic cases. The operation advocated by Cheyne is a simple one, consisting in opening the abdomen in the middle line below the umbilicus, allowing the fluid to run out or removing it by means of sponges, and then closing the wound without

¹ Harveian Lectures on the Treatment of Tuberculous Diseases in their Surgical Aspects, 1900.

drainage. Cheyne does not regard the co-existence of early phthisis a contraindication, but would not operate in the presence of advanced tuberculous disease of the lungs. In cases associated with intestinal ulceration he believes operation of doubtful value. After a careful study of the data at our command, one must conclude that while the milder cases with serous exudate may recover under medical treatment, on the other hand a cure will probably be more rapidly obtained by laparotomy. I believe that medical treatment should first be tried in most cases before resorting to surgery. In the advanced cases with many adhesions, it is doubtful if operation should be employed.

HERNIA.

Traumatic Hernia. Bilfinger¹ contributes a very valuable paper on the question as to the origin of traumatic hernia. He touches upon the great practical importance of the subject with reference to accident insurance, and then turns to the scientific aspect of the subject. Before entering into the question as to whether there is such a thing as a traumatic hernia, he states it is essential that we should have a clear understanding as to what constitutes a traumatic hernia. He does not agree with Lindner's view as expressed in the *Berliner Klinik*, 1892, No. 49, namely, that traumatic hernia is due to an injury to the abdominal walls disturbing their continuity at some point, either in their entire thickness or only in some layers, and to the fact that in this way the tissues, with their normal elasticity, are replaced by cicatricial tissue. It is not necessary that the injury causing the rupture should result from a sharp instrument that severs the tissues, but may have been inflicted by a dull instrument striking the abdominal wall over a broad area, and which, while leaving the skin intact, may nevertheless so badly crush the muscular structures that it will not regain its former normal consistence.

Such ruptures, Bilfinger states, he would prefer to designate as "hernie on a traumatic basis." They are comparatively frequent. A true traumatic hernia, to his mind, would have to fulfil the following conditions :

1. The hernia must be completely developed immediately after, or at least within a very few days after the receipt of the injury.
2. There must have been no predisposition to hernia, no matter of what nature ; thus, no latent hernia, no empty hernial sac.

Whether the course of the hernia follows one of the natural canals (inguinal or crural canal), or creates its own passageway, is immaterial.

¹ Archiv f. klin. Chir., 1901, vol. lxiv., No. 1.

In referring to the attitude of the profession generally toward the question of traumatic hernia, Bilfinger cites the opinions of Roser, König, Socin, and others, all to the effect that the sudden development of a hernial sac is impossible, or at least incompatible, with their experiences.

The number of those who admit the possibility of the occurrence of a hernia on a purely traumatic basis, as a result of trauma, is small. Witzel believes that through undue stretching or bending of the body backward, etc., fissures may be produced in the linea alba through which, either immediately or some time after the injury, a small hernia may extrude. Orth and Seidel, too, have acknowledged the traumatic origin of these herniæ. Streubel admits that traumatic herniæ do occur in direct connection with subcutaneous muscular ruptures.

Graser, in the *Handbook of Practical Surgery*, 1900, vol. xx., p. 826, states: "It is the consensus of opinion among those who have given the subject most careful attention that the sudden complete development of a hernia is a very rare occurrence—so rare that it is hardly of any significance from a practical stand-point."

The reason for the fact that nearly all surgeons deny the existence of traumatic herniæ, Bilfinger states, is to be found, partially, in the uncertainty of intra-abdominal pressure; partially, in the theoretical impossibility of an explanation, and, lastly, in the unsuccessful experiments.

Bilfinger describes the experiments that have been made in order to throw light upon the question of traumatic hernia, and states that while it has been impossible so far to produce traumatic hernia by experiment, it must be considered that a number of conditions come into play which it is difficult to produce artificially, and these support one another in a very definite way in the individual case. He adds that, while the negative results of the experiments support the view that traumatic herniæ are rare, the mechanism must be very complicated; they do not speak against traumatic hernia.

Theory and experiment having failed to prove the possibility of true traumatic hernia, Bilfinger states there is but one way of proving its existence, and that is by means of an actual case that fulfils all the conditions stated. He then gives a detailed account of a case observed by him at the City Hospital in Gmünd, which answers absolutely all the requirements of a true traumatic hernia. In spite of most careful search in the literature, he succeeded in finding but one other case in which the traumatic nature of the hernia left absolutely no doubt. This is the case of Lotheisen, observed at von Hacker's clinic.¹ He

¹ Centralblatt f. Chir., 1898, No. 7.

adds a number of other cases in which the traumatic origin of the herniæ was evident, although not beyond all doubt.

Bilfinger arrives at the conclusions that while modern science, with few exceptions, assumes a negative attitude toward the question of traumatic herniæ, they nevertheless occur. Proof can be had only through autopsy.

That traumatic herniæ are rare; but not as rare as is generally believed.

That traumatic herniæ may occur in the natural abdominal canals—for example, inguinal or crural canal—has not yet been definitely shown. Although this is difficult, there is no reason to doubt their occurrence, since they are not impossible, anatomically.

As to definite clinical characteristics, traumatic herniæ have none.

As far as is known at present, traumatic herniæ are produced or caused only by direct heavy application of force at the site where the force was applied. I have recently examined a patient—male, aged forty years—with direct inguinal hernia, caused by being thrown against the corner of a car seat in a railroad collision. The hernia appeared immediately after the injury. I have also seen two other cases at the Hospital for Ruptured and Crippled in which the hernia appeared immediately after the local injury.

Lateral Ventral Hernia. De Quervain¹ publishes a brief paper on lateral ventral hernia. He states that the term “lumbar hernia” has been used to include so many widely different anatomical conditions that he considers a division of this class of herniæ into three categories pertinent:

1. Herniæ that eventrate through one of the natural weak spots of the lumbar region, Petit’s and Grynfeltt’s triangle, or through an abnormally large vascular space in the musculature (Braun)—true lumbar hernia.

2. Herniæ that eventrate through an abnormal congenital space in the musculature, or are due to the absence or defective construction of an entire muscular region—hernia ventralis lateralis (Wyss).

3. Herniæ caused by an injury or purulent process. The latter group is excluded from the discussion, since they are not governed by any anatomical rule.

De Quervain gives a detailed description of a case observed by himself, which belongs in the second group, and briefly refers to eight other similar cases that he found reported in the literature. All belong to the second category, and prove that even after this classification many differences exist. The one feature that is common to all

¹ Archiv f. klin. Chir., 1901, vol. lxx., No. 1.

is that the trouble was congenital, or at least was observed during the first months of life. In many instances the patients show other congenital anomalies besides the hernia.

In view of his observations, de Quervain believes that the complex of symptoms designated as lateral abdominal or lumbar hernia may arise not only from a congenital defect of the abdominal musculature, but also from sharply defined paresis and atrophy of the lateral abdominal muscles, the etiology of which is not yet clear, although it is probable that the phenomenon is traceable to a diseased condition of the supplying nerve (subcostal nerve), or its source in the spinal column; and that the clinical picture of such paresis is so similar to that of an extensive muscular defect that only anatomical examination permits of a reliable diagnosis.

Sliding Hernia. Savariaud, of Paris, at the last French Congress of Surgeons,¹ describes a procedure for the radical cure of hernia "par glissement," or sliding hernia of the large intestine. His method is to return the sac without resection. He thinks it important to separate the sac thoroughly, and to make the proper reduction. This dissection, he thinks, is best accomplished by means of a sterilized gauze pad, without risk of doing harm to the vessels nearest the intestine.

In my last article I discussed at some length the treatment of these so-called sliding herniae of the caecum and sigmoid. I have operated upon a large number of these cases, and, while they are much more difficult to manage than the ordinary inguinal herniae, I believe that radical cure can best be accomplished by opening and removing a portion of the sac rather than by its reduction.

Cæcal Hernia. The fact that cæcal hernia may occasionally occur on the left side is shown by two cases reported by John H. Gibbon.² In a paper published by the same author in the *Journal of the American Medical Association*, June 11, 1898, he states that out of 63 cases of cæcal hernia collected, the caecum was found in the sac of a left hernia in 7. Gibbon states that of 9 cases of left cæcal hernia which he has collected, but 1 occurred in the female, and this was of the femoral variety, all the remainder being inguinal herniae in the male.

The cause for cæcal hernia he regards as due to at least two conditions:

1. A small but freely movable caecum. 2. Pre-existing hernia in the small intestine.

He calls attention to the fact brought out by Treves that the caecum is not nearly so fixed as was formerly supposed. In the examination

¹ *Revue de Chir.*, 1901, No. 11, p. 564.

² *Annals of Surgery*, 1901, p. 154.

of 100 bodies Treves found that in most instances the cæcum could be carried to the opposite side of the abdomen and as high up as the liver.

Of the 63 cases collected by Gibbon 28 were strangulated, 2 incarcerated, 11 irreducible, 10 not stated, and only 11 reducible.

I have personally operated upon 34 cases of caecal hernia, and in one instance the cæcum and appendix were found in a left inguinal hernia. The appendix was removed and the hernia reduced and Bassini's operation for radical cure performed.

A New Suture for the Radical Cure of Hernia. Dr. L. L. McArthur, of Chicago,¹ describes a new suture for operations for the radical cure of hernia. This suture, which he designates as "autoplastic," consists of the strip of tendinous portion of the external oblique, in inguinal hernia. In regard to the technique, he says: "The skin and fat having been cut, exposing the external ring, the latter is prolonged upward in the line of separation, paralleling exactly the tendinous fibres of the external oblique muscle, to its commencing muscular insertion. This divides the aponeurosis of the external oblique into an external and internal flap. The sac having been treated as the operator may prefer, a bunch of the white fibres which enter into the formation of the internal pillar of the ring are then split off from the edge of the internal flap of the external oblique, quite up to their insertion in the muscle belly, where they are cut loose from the muscle, but left attached to the spine of the pubis. This strip should vary in width from one-eighth to one-quarter of an inch, according to the development of the tendinous fibres which, in children and women, are not so strong as in the male adult. In case a Bassini is done, a similar strip is taken from the outer flap, the lower end of which terminates in the fibres of the external pillar of the ring. The operation is then completed according to the choice of the operator, these strips being used as a suture material for a running stitch."

McArthur advises using a strand of No. 3 silk to be threaded in an ordinary curved needle, one end being tied tightly to the free end of the tendon suture. The first stitch is so applied as to give the desired lumen to the new external abdominal ring, using the one terminating in the internal pillar for the first suture, the remaining one for the superficial layer and buried stitches. The skin can be closed by any method of suture the operator prefers. McArthur states that he has used this method of suture in twelve cases, in all of which the wounds healed by perfect primary union. He believes that the advantages of this suture over other forms of absorbable suture material are:

¹ Journal of American Medical Association, November 2, 1901, p. 1162.

1. The obtaining of a living suture.
2. Lessened chance of failure through avoidance of the introduction of dead or foreign tissue.
3. Incorporation in resisting cicatrix of organized white fibrous tissue.
4. Applicability of the same procedure to other situations.

In experimenting on dogs McArthur states that he was able to demonstrate that the tissue heals *in situ*, and is neither absorbed nor followed by sloughing. His observation, that in case of non-absorbable sutures like silk or silver wire it is not uncommon after primary union to have auto-infection a year or more afterward, necessitating the removal of the offending suture, is certainly correct, and has been frequently demonstrated by our experience at the Hospital for Ruptured and Crippled. His statement that failure to cure a hernia by any of the recognized methods of operation is practically always due to an associated infection, is likewise borne out by our experience.

This method, if introduced a few years ago, when it was difficult or impossible to perfectly sterilize absorbable sutures, would certainly have commended itself to every surgeon interested in the radical cure of hernia. At the present time, however, when we are able not only to render absorbable sutures perfectly sterile, but also by treating them with chromic acid to delay absorption for any desired period of time, it seems to the writer that the operation for the radical cure of hernia can be more perfectly performed with the interrupted absorbable sutures than it would be possible by the method described. With the addition to our technique of rubber gloves and more perfect methods of rendering the skin of the patient aseptic, suppuration at the present day should be a thing of extreme rarity. McArthur's method is certainly a most ingenious one, and if it is proved by experience that the suture retains its vitality it may prove a valuable addition to our technique.

The Operative Treatment of Umbilical Hernia in Adults. In my last article in *PROGRESSIVE MEDICINE*, June, 1901, a brief reference was made to an operation for the operative treatment of umbilical hernia, introduced independently by Piccoli, Sapiejko, and Blake, of New York.

In the *Medical Record* of May 25, 1901, Blake described his operation with considerable detail, and reports a series of cases in which the method was used.

The improvement of the treatment of umbilical hernia in the adult is shown by Berger's statistics, which give 22.16 per cent. of all hernie in the female over fifteen years as umbilical.

Blake does well in calling attention to the fact that statistics purporting to give the results of operation for umbilical hernia have, up to the present time, been of little value, for the reason that many cases reported are

isolated, and it is difficult to estimate the correct proportion of cures to failures. According to Berger, relapses occur in 30 per cent. of the operations for large herniæ, in 15 to 20 per cent. of those of moderate size, while of the cases in which suppuration occurred during wound healing 60 per cent. relapsed.

The statistics of Bull and Coley at the Hospital for Ruptured and Crippled show that of 21 cases of umbilical hernia in the adult traced, 12 relapsed, giving more than 50 per cent. of relapses.

The method of lapping the abdominal wall, advocated by Blake, and which he regards as particularly applicable in the cases in which there is a stretching of the linea alba, with separation of the recti, consists of the division of the linea alba above and below the sac in the median line to the necessary distance, with or without excision of the ring. The entire wall on one side is then lapped in front of the other, and they are sutured so that the ventral surface of the one side is in contact with the dorsal surface of the other. In the three cases reported by Blake he used No. 2 chromicized catgut for the aponeurosis and muscle, silkworm-gut for the skin. Since the publication of this article Dr. Blake has performed quite a number of similar operations, and up to the present time he has failed to see a recurrence.

A similar method was described by W. J. Mayo before the American Surgical Association in May, 1901. The cases of Blake and Mayo, as well as those of the European authors, are too recent to enable one to fully determine whether the operation is an improvement on some of the older methods or not. Personally, I believe that it is probably the best operation thus far originated. On the other hand, we still believe that it is unwise to subject a very large proportion of patients with a voluminous irreducible umbilical hernia to any form of operative treatment. The danger from operation is considerable and the probabilities of relapse very great. I believe that the proper method of treating umbilical hernia in women is to operate when the hernia is very small and before it has become irreducible. Operation under such conditions is likely to be followed by very much better results than we have been able to report and will tend to lessen the number of inoperable cases.

The Worsted Truss in Inguinal Hernia. This has again been recently brought forward by Dr. J. C. Hubbard, of Boston.¹ Hubbard states that the feeling in Boston is that the truss of worsted is as effective as the more elaborate ones, and that if a cure results from truss treatment it is as likely to follow the wearing of this form as of any other. He further states that all cases of hernia that he has been able

¹ *Annals of Surgery*, October, 1901, p. 523.

to look up at the Infants' Hospital were given a trial with the worsted truss, and in no case where this failed did any other succeed.

We are left in considerable doubt as to the meaning of the word "failure," as it may refer to failure to retain the rupture or to failure to effect a cure.

Hubbard states that the worsted truss has certain definite advantages over other forms, the principal advantages being that it is cheap, and when soiled can be washed or changed.

Our personal experience with the worsted truss at the Hospital for Ruptured and Crippled fully demonstrated, to our minds, that it was distinctly inferior to a properly constructed and well-fitted spring truss.

A spring truss can be made perfectly comfortable for any child, no matter what the age or size. Such a truss will not only control the rupture, as well as the worsted truss, but is much more cleanly and easier to manage.

Hubbard states that he has been able to trace 17 cases of inguinal hernia treated at the out-patients' department of the Infants' Hospital. Truss treatment cured 6 of these, and in 11 it proved unsatisfactory. In the 11 failures the truss was tried long enough, he states, to prove its inefficiency, and not until then was operation advised. These 11 cases in which operation was advised after trial of the truss averaged two years and seven weeks in age, the variations being from two months to seven years.

Personally, I do not believe that truss treatment has had a fair trial until the child is more than two to three years of age, and that the operation is seldom indicated under the age of four years. At the Hospital for Ruptured and Crippled, about ten years ago, we treated a series of 250 infants and young children alternately with a spring and a worsted truss, carefully following up the after-history. The result of this experience fully convinced us of the advantages of the spring truss over the worsted truss.

Radical Cure of Hernia. At the last French Congress of Surgery, Lucas Championnière gave the statistics of 1030 cases of operation for the radical cure of hernia. These operations cover a period of twenty years. Championnière has long advocated radical operation for all herniæ. His statistics show 868 operations for inguinal, 82 for femoral, 38 umbilical, 15 epigastric, 27 for eventrations. He believes that the operation for inguinal hernia is most nearly ideal, and regards his own method as the best. Of the three most essential steps he regards as first, reduction of the sac; second, removal of the accessible omentum; third, reparation of the inguinal canal, not by linear cicatrices, but by overlapping the thin muscular and fascial planes. The entire series of operations show a very low mortality. In the total of 1030 cases 7

deaths occurred, giving a mortality of 0.68 per cent. ; 2 of these deaths occurred in epigastric hernia, and 1 after operation for eventration. The remaining 4 occurred in operations for inguinal hernia, 860 in number, or 0.46 per cent. Adding the femoral and umbilical herniæ to the inguinal, Championnière had 988 cases, with 4 deaths, or a little less than one-half of 1 per cent. There was no case of peritoneal sepsis. Three deaths were due to pulmonary congestion, 2 to strangulation by an old band, 1 to tetanus, and 1 to hemorrhage. The younger subjects, those under twenty-three years of age, showed no mortality. Championnière had two series of 265 and 285 successive cases, respectively, without mortality.

In my own cases there have been 2 deaths in 950 operations, 1 due to ether pneumonia, and the other probably to volvulus, but I have had one series of 476 cases without mortality. 7

With the exception of 10, Championnière has never applied trusses after operation in any of his cases.

In regard to final results, recurrence was observed in 32 out of 868 inguinal herniæ. In the 82 cases of femoral hernia recurrence was observed in 4. In 38 umbilical herniæ there were 3 recurrences. But even in the cases of return, the condition was an improvement over that prior to operation. Championnière has observed many cases of a cure of eight, ten, and twelve years' duration. In umbilical hernia or eventrations he advises the use of a belt after operation. He has observed only one return after operation for epigastric hernia. Championnière has operated upon 196 cases of inguinal herniæ in the female, and he was one of the first to point out the fact that this condition was the most amenable of all varieties to radical cure. Only one recurrence was noted in this series.

My own experience with radical operations for inguinal hernia in the female confirms Championnière's opinion. In a series of 165 cases operated upon within the past ten years there has not as yet been a single return, and the great majority of the cases have been traced to final result.

Championnière attributes a large number of the recurrences which one continually observes to either bad technique or to operations too hastily performed.

Rapid execution of operations for the radical cure of hernia, I believe to be a distinct advantage, though, of course, not at the sacrifice of perfect technique. There is no operation in which perfection of technique is more important to success than in the one for the cure of hernia. The most serious danger following operations for the radical cure of hernia Championnière believes to be pulmonary congestion. He also considers hemorrhage from the omentum a grave complication.

Tuberculosis of the Hernial Sac and Tuberculous Lesions of the Appendix have been recently reported by E. Wyllys Andrews.¹ Pitha, in 1845, was the first to report a case of hernial tuberculosis, the patient being a woman with general strumous symptoms, who had a right femoral hernia, which was operated upon for strangulation. A diffuse thickening of the sac and bloody serous effusion were found. The autopsy showed general tuberculous peritonitis, extending into the hernial sac. Andrews refers to the cases reported in the literature by Lejars, von Brackel, Jonnesco, Phocas, Bruns, and others, making up to the present time thirty-eight cases. To these he himself adds two reported cases. The first, a girl, aged twenty-three years, with a left femoral hernia of two years' duration. Operation showed a thick sac studded with fibrous nodules filled with yellowish serum. Opening into the peritoneal cavity could only be made with a probe, and probably was not patulous. Microscopical diagnosis was negative as to bacilli, but the nodules showed much round-cell infiltration and giant cells.

The second case was that of a man, aged forty-seven years, with a large right scrotal hernia, partly irreducible. Operation showed a very thick sac studded with many nodules and a rolled-up mass of omentum adherent to the sac. The loops of intestine, as well as omentum, were covered with small tumors. The after-history of the patient was not traced.

Andrews states that the true condition is seldom recognized before operation, and that the disease may either be primary or secondary.

Jonnesco believes that the tuberculous process has a predilection for the hernial site on account of the interference with the circulation, possibly because of a slight trauma caused by trusses.

Andrews believes that in certain cases it is possible to make a diagnosis before operation, and mentions the following points as an aid to diagnosis :

1. No bowel in sac, but some fluid.
2. Sac distends, with upright position.
3. Sac refills quickly after emptying.
4. No gurgling is felt or heard on taxis.
5. Spontaneous return on lying down.
6. Percussion note dull.
7. Sac feels thick and irregular.
8. Sac is often tender and inflamed.

Andrews concludes that all cases, general or local, should be operated upon early ; that the sac and all the diseased omentum should

¹ *Annals of Surgery*, December, 1901.

be removed high up. If the tuberculous process is found during operation, he believes it would be better to make a general laparotomy at once; if this cannot be done, to perform laparotomy subsequently. In my own cases there was nothing that pointed to a diagnosis of tuberculosis of the sac, and I do not believe the diagnosis can ever be made before operation. I would not advise a laparotomy in such cases. I have operated upon three patients with tuberculosis of the hernial sac.

My first patient was a young woman, aged twenty-three years, with a right femoral hernia of two months' duration. I operated on her at the New York Cancer Hospital, March 1, 1899. The hernial sac was about the size of an English walnut, and was found completely empty with the exception of a very small amount of fluid. The sac communicated freely with the abdominal cavity, and was thickly studded with small white bodies resembling tuberculous nodules. The diagnosis of tuberculosis of the sac was made from the macroscopical appearance. The specimen was carefully examined at the laboratory and pronounced tuberculous by the pathologist, Dr. Buxton. The subsequent history of the case I have been unable to trace. The other two patients were children under ten years of age.

APPENDICITIS.

Treatment of Appendicular Abscesses. At the Thirtieth Congress of the German Society for Surgery, Berlin, April 13, 1901,¹ Rotter read a very interesting paper on the "Treatment of Acute Perityphlitis." He states that in the operative treatment of this disease, generally consisting in the removal through an incision in the anterior abdominal wall of the more or less encapsulated pus accumulations within the abdominal cavity, the evacuation of abscesses in Douglas' sac so frequently encountered, is a most difficult and dangerous procedure in that it is so easily possible for the operator, in trying to reach the sac through adherent coils of intestine, to open the free peritoneal cavity without noticing it, thus making it possible for the pus to enter and infect the general peritoneal cavity. These accidents, Rotter states, are far more frequent than is generally believed.

In view of this danger he has, since 1896, invariably opened abscesses of Douglas' sac from below the rectum, perineum, or vagina in a very simple manner, without narcosis. He employs a tong-shaped instrument which he pushes along the puncture-needle, drilling into the abscess cavity through the anterior wall of the rectum, or, in women,

¹ Archiv f. klin. Chir., 1901, vol. lxiv., No. 3.

through the posterior wall of the fornix vaginae, and thus evacuating the pus.

This method, he thinks, has two great advantages : (1) It positively prevents accidental opening of the free abdominal cavity ; (2) it affords an excellent chance for the escape of the pus, the latter being evacuated at the lowest point.

Rotter states that since the introduction of this method the results of operation in the serous, diffuse cases of perityphlitis have considerably improved over those obtained by the old method used up to 1895.

In the circumscribed form of the disease Rotter generally allows the attack to pass, under internal treatment, whenever possible, and then performs radical operation during the interval. He does the radical operation more and more frequently, often advising them after the first attack, and his results have been excellent, which is quite at variance with the experience of Kehr and Sprengel. He lost but one patient in a series of 150 cases of radical operation, and this was proven to have been due to catgut infection. In the diffuse form he operates early, his rule being to operate if vomiting and pain have not subsided on the third day.

Rotter states they exclude only such cases as come to the hospital in a moribund condition. During the period of 1893 to 1895, 54 out of 213 cases, or 26 per cent., were treated by operation. During the period from 1896 to 1900, 196 out of 530 cases, or 37 per cent., were operated upon. About one-half of all the cases were circumscribed perityphlitis, with a mortality of 7 per cent. during the first period and 5 per cent. during the period from 1896 to 1900. These deaths were due to unavoidable complications, such as pneumonia, etc.

While in the circumscribed cases the death-rate remained about the same during the two periods, considerable difference was noted in regard to the diffuse cases. Sixty per cent. of the 26 diffuse cases operated upon between 1893 and 1895 died, while in the 101 cases of diffuse perityphlitis of the second period the mortality was only 34 per cent.

Rotter believes that this improvement is principally due to the fact that abscesses of Douglas' sac are now opened from below, which opinion finds confirmation on comparing the results of the two methods : Douglas' sac was opened in 70, or 70 per cent., of the diffuse cases ; 61 times from below, with 10 deaths ; 9 times from above, with 6 deaths.

In view of these facts, he urgently recommends the method of opening the sac from below.

Rotter is unfavorably inclined toward irrigation. I believe, however, that if patients with appendicitis are properly treated there will seldom arise the necessity of operating upon these large abscesses that

Rotter describes: such cases, though frequently observed in America ten years ago when early operation was seldom performed, have now become comparatively rare.

The method that Rotter advocates cannot be called curative, for in many cases it becomes necessary to go in from above later on or remove the remains of the appendix, which keeps up prolonged suppuration. In certain cases in which the patients are much reduced in strength, such opening from below is indicated, but not, I think, as a routine measure.

Chronic Appendicitis. The condition of the appendix in the various stages of chronic appendicitis, the influence of concretions as a causative factor of the disease, is well brought out by Dr. Abbé, in his anniversary address, on "The Problem of Appendicitis from a Medico-surgical Point of View."¹ In his discussion of the question as to the cause of the apparent increase of appendicitis during recent years, Abbé alludes to the possible connection with the subject of influenza or "grippe." This idea is further developed by Finney in a more recent paper.

Abbé states that he has twice removed an appendix two weeks or more after the subsidence of appendicitis in conjunction with an attack of acute influenza. Above all things, he believes that the mechanical conditions revealed in the state of his large collection of appendices, most carefully prepared and illustrated, throw much light upon recurrent attacks. He believes that, given an appendix with one or more tight strictures, it is only necessary to produce transient congestion to swell the tissues and block the strictures. The acute attack is due to general vascular disturbance of the alimentary canal, in which hyperæmia of the appendix takes place. He believes that even menstrual disturbances may provoke acute attacks in cases of latent trouble. The key of this engorgement is increased secretion within the appendix, with increased bacterial activity, which, together, distend the appendix. He believes that most of the patients cured by medical means are not really cured, but are in a condition which may be the source of grave danger at any time.

Early Operation in Acute Appendicitis. Sprengel,² in his paper entitled "Contribution to the Question of Early Operation in Acute Appendicitis," states that in order to determine whether early operation will reduce the mortality of perityphlitis, we should make a collection of all such cases that are operated upon within the first two to twenty-four hours after the diagnosis of acute appendicitis has been made. It is his belief that in the light attacks operation may be regarded as almost absolutely safe.

¹ Medical Record, February 16, 1901.

² Archiv f. klin. Chir., vol. lxiv., No. 1.

He states that, according to Renvers, the mortality of the disease, when treated by internal medication, is 6 to 10 per cent. This, however, does not include cases of appendicular peritonitis, and, hence, as Renvers himself admits, is too low a figure.

Kümmel's statistics, covering 700 cases, of which 56 were operated upon, with 34 deaths, while only 24 deaths occurred in the 644 cases in which no operation was performed, Sprengel does not consider of value for the question under consideration, inasmuch as it is evident that in a hospital where acute appendicitis is treated on a conservative basis, only the absolutely bad cases are subjected to operation.

Beck places the mortality of appendicitis when expectant treatment is observed at 30 per cent. Sahli, on a basis of a survey of 7000 cases in which the various methods in vogue were employed, estimates the mortality at 10 per cent. Riedel estimates the total mortality at 12.5 to 14 per cent. Sonnenburg, at 13.5 per cent. Brentano, in his collective statistics on "The Surgical Treatment of Appendicitis in France," gives the mortality as 14 to 15 per cent.

Turning to the question as to the prognosis in cases in which early operation—*i. e.*, within the first two or twenty-four hours—was performed, Sprengel states that Beck, in a series of 27 cases which he could operate upon within the first twelve hours after the onset of the attack, did not lose a single patient, while in the cases that were operated upon more than forty-eight hours after the onset the mortality was 24 per cent. Mayo, of St. Mary's Hospital, Rochester, Minnesota, during 1899-1900, has operated upon 115 cases of acute appendicitis during the attack and 160 during the interval. All of the latter recovered, while in the former there were 6 deaths, or a mortality of 5.2 per cent. Sprengel believes that, in all probability, these statistics do not even do justice to early operation in that they include not only cases operated upon within the first two to twenty-four hours, but all cases operated upon during the attack. On the other hand, it proves that the surgeon who, on principle, operates early obtains far better results than the physician treating these patients on a conservative basis.

Sprengel states that while Riedel and Rose have recommended early and radical operation, they do not advocate early operation in every case where the diagnosis of acute appendicitis has been made. Riedel believes only the so-called serious forms should be operated upon, although he himself admits that it is often difficult to render the differential diagnosis between purulent and non-purulent appendicitis. Rose is in favor of postponing operation to the interval in the so-called "fresh but deliberate" forms.

Referring to Kehr's annual report for 1900, in which he states that while the mortality of his operations for recurrent appendicitis in the

light cases was 0 per cent., it was 10 per cent. in the serious cases. Sprengel adds his opinion that the interval operation in the serious cases is by no means without risk ; in fact, he considers it one of the gravest abdominal operations. He states that his personal experience has taught him not to operate upon every case of recurrent appendicitis in the interval. He makes it a rule to ascertain the nature of the previous attacks, and, on basis of this as well as careful palpation of the right iliac fossa, he forms his conclusion as to whether a comparatively free or more or less adherent appendix is to be expected. In the former case he advises operation in the interval ; in the latter he advises against operation, but impresses upon the patient the importance of coming to the hospital on the first day in case of another attack.

With this opinion I do not concur, for the reason that, admitting the severity of the operation, in recurrent cases with adherent appendices the operation is certainly attended with less risk when performed during the interval than during the "next attack," which is pretty certain to come.

The Mortality of Appendicitis. Deaver,¹ of Philadelphia, gives the statistics of 268 cases of appendicitis operated upon at the German Hospital, in Philadelphia, during 1900 : 144 of these cases were operated upon during the acute attack ; 124 were cases of chronic appendicitis. In those operated upon during the acute stage the mortality was 17.8 per cent. In one case death was due to diabetic coma ; in another to advanced phthisis ; in still another to post-operative pneumonia. Deducting these 3 cases, Deaver estimates the mortality at 15.9 per cent. Of the 26 fatal cases, 7 had general purulent peritonitis at the time of operation ; in 7 others general peritonitis developed after operation ; in 8 cases death was due to septicæmia ; in 7 others to post-operative peritonitis. The appendix was removed in every case.

In the chronic cases there was one death, or 0.8 per cent. Deaver states, contrasting this record with those operated upon in the presence of pus or gangrene, of which there were 144, with 26 deaths, the grounds for a belief in early operation are plainly seen.

Inasmuch as 124 cases were chronic—presumably "interval" cases, in which operation was not performed in the acute attack, but the patients had been tided over until the symptoms had subsided—the reasoning by which Deaver arrives at his conclusion is not clear. There would be quite as much ground for stating that if some of the 144 cases operated upon during the acute stage had not been operated upon until the subsidence of the attack, 26 deaths might not have occurred.

¹ Journal of the American Medical Association, October 5, 1901, p. 898.

Deaver believes that in cases of appendicitis, with localized collections of pus, the success of the operation depends largely upon the success in emptying and thoroughly draining every pocket of pus. He believes that irrigation frequently causes infection of the general peritoneal cavity, and should be used with great caution. When the abscess is localized outside of the cæcum the prognosis is the most favorable, and by making a counter-opening in the lower end, free drainage can be easily secured. The most dangerous collections of all, he believes, are the local collections in the general abdominal cavity rather than in the pelvis or about the cæcum. Post-cæcal collections he also regards as very serious. Deaver has long advised always removing the appendix in the presence of pus, and still believes this to be the most important part of the operation. While he admits that there are a few cases in which the depressed condition of the patient is such that we must be content with draining the abscess, leaving removal of the appendix to a later operation, he regards these cases as very exceptional. With this view we are in entire accord.

In the 118 cases operated upon during the acute stage in which recovery followed operation, pus was found in 61, and in 21 of these the appendix was perforated and gangrenous. In 25 cases the infection had occurred by a passage of the micro-organisms through the walls of the appendix without perforation. In 3 cases the condition of the appendix was not noted; in 57 the inflammation was confined to the appendix; 56 cases were operated upon during the first attack, while in 62 cases there had been on an average four attacks. It is stated that during the year there were 11 cases of acute appendicitis at the hospital in which operation was not performed, 3 of which died.

In regard to the time between onset and operation, Deaver states that, barring some cases of the fulminating variety, when nothing is of avail, there are no cases which, if operated upon within the first twelve hours, or at the latest eighteen to twenty-four hours, that cannot be saved. Early operation, he believes, not only saves the life of the patient, but lessens the difficulty of operation and avoids the disagreeable sequelæ of later operations, namely, fecal fistula and adhesions. Deaver is extremely skeptical of reported cures of general septic peritonitis, and believes that in most or all of such cases reported the infection was localized, with some healthy uninfected peritoneum present. There are many cases in which it is not possible to make an absolute diagnosis in twelve or even in twenty-four hours.

Drainage in Appendicitis. Morris¹ says that gauze packing in the abdomen sometimes causes ileus and obstruction by direct mechanical

¹ Medical Record, 1902.

pressure. It more often causes an excessive exudation of reparative lymph, which may result in annoying peritoneal adhesions, and leaves a weak spot in the abdominal wall to invite ventral hernia. But its worst feature is that it does what any other foreign body would do—depresses the patient and prolongs if it does not cause surgical shock. A depressed patient cannot manufacture phagocytes well, and therefore cannot meet infection well. Morris attributed Tait's success to the fact that by his rapid and dextrous work he caused a minimum disturbance of the patient's vital functions. Morris indorsed Clark's theory that if the surgeon removes the chief part of the toxic collection the lymphatics and leucocytes will look after the rest better than it can be done with gauze drains. He admitted that in some cases—for example, those in which there is continued oozing from separated adhesion surfaces, or in which the infected peritoneum is rapidly secreting serum—drainage is necessary. The drain should be of the smallest and simplest kind. "It is not safe to teach that gauze packing is to be given up at once. It is better to say that one should work toward the point of giving it up as rapidly as experience shows that it can be done safely."

Westbrook¹ takes a more conservative view. His conclusions are as follows :

1. There are as yet no well-recognized formulæ to guide the surgeon as to when to omit drainage in purulent collections attending appendicitis.

2. While it is true that the peritoneum may be relied upon to take care of a certain quantity of infectious material, we have no means of estimating in any individual case what that quantity may be. It is contrary to experience to expect the peritoneum to care for any large quantity of infection, otherwise we would never have to operate at all for appendicitis or septic peritonitis.

3. An estimate of the individual's resistive powers to infection may be approximately made by the usual methods of consideration of the condition of his lungs, kidneys, etc.; his pulse and temperature; his previous health and ailments, and perhaps, in some instances, by the amount of leucocytosis found on blood-examination. But we have no means of placing over against this, at the time of operation, an accurate estimate of the amount and virulence of the infection with which the patient's resistive powers will have to contend. We cannot estimate any individual susceptibility or immunity to infection which he may possess.

4. If the surgeon decides to omit drainage in any case of appendicitis with outlying infection, he must do so relying entirely upon his

¹ Brooklyn Medical Journal, February, 1902.

personal ability to estimate the clinical facts in the case and the nature and extent of the pathological process exposed at operation. Then, if his previous experience has brought him to the point of omitting drainage, he is warranted in so doing.

5. The majority of surgeons the world over still consider drainage necessary in all degrees of the class of cases under discussion, and that we must consider the safer teaching. This is the position I have always taken, and I believe there is no reason as yet to change it.

THE ABDOMEN—GENERAL.

Examination of Blood as an Aid to Surgical Diagnosis. It must be admitted that the first reports upon the examination of the blood as an aid to the surgical diagnosis much exaggerated its importance; but one should not on that account reject it altogether as having no clinical value. This method of examination, as others, yields the most information to him who follows it the most carefully. It was pretty well shown by the discussion upon the subject at the last meeting of the American Surgical Association¹ that a single blood examination is of little or no value, but that a series of examinations, like a temperature-curve, may give a very accurate picture of certain surgical conditions.

Da Costa examined the blood of eighteen patients suffering from appendicitis, and draws conclusions as follows:

1. In the average case of appendicitis before operation there is a loss of about 30 per cent. of hæmoglobin and of more than half a million of erythrocytes per cubic millimetre.

2. Leucocytosis accompanies about 35 per cent. of non-purulent and 90 per cent. of purulent cases.

3. Leucocyte counts of ten thousand, fifteen thousand, or even seventeen thousand give no sure indication of pus. Counts of twenty thousand or more invariably indicate pus, gangrene, or general peritonitis.

4. Leucocytosis may be absent in trivial catarrhal cases because of the lack of poison, in fulminant cases because of the inability of the system to rise to meet the poison, and in circumscribed abscesses because the poison is shut off from the general circulation.

5. Thorough evacuation of the abscess is followed in a few days by a decline to the normal number of leucocytes. Persistence of leucocytosis after the third or fourth day following operation may usually be attributed to pocketing of pus or to peritonitis.

6. Absence of leucocytosis is of no prognostic value except in

¹ Transactions of the American Surgical Association, 1901, vol. xix, pp. 60 to 144.

persons unmistakably septic. It is then a sign of intense infection, and the prognosis is naturally bad.

7. The adoption of leucocyte counting daily after operation furnishes the surgeon with definite information as to the progress of the case.

8. Leucocytosis is, unfortunately, present in most of the diseases which may closely resemble appendicitis; for example, ovarian or tubal abscess, perinephritic abscess, hepatic abscess, suppurative cholecystitis, ectopic gestation, and cancer of the cæcum. A leucocytosis would exclude from the diagnosis simple enteralgia, lead colic, ovarian neuralgia, ovarian cyst, and movable kidney.

Cabot,¹ Hubbard, and Blake found that: 1. Complete anaesthesia sometimes gives a slight increase in the number of the leucocytes, but rarely a marked increase. 2. At the end of an operation there is a considerable leucocytosis in about one-half the cases. 3. Simple uncomplicated fractures rarely increase the leucocytosis to any considerable extent. It is well to remember that an hourly leucocyte count will often show variations in a healthy individual, for example, from seven thousand to eleven thousand.

Bloodgood² mentions a slight post-operative increase of leucocytosis, more marked if there is a considerable loss of blood, but which will disappear in twenty-four or thirty-six hours, unless some complication exists. In intestinal obstruction there is a marked leucocytosis within eight to twenty hours of the obstruction, possibly before clinical signs are well marked. Counts thus far made show that there is no leucocytosis, or, at most, not above twelve thousand or fifteen thousand in patients who suffer from nausea and vomiting and abdominal distention after operation, when these symptoms are due to paralysis of the intestine and not to obstruction.

A count of the white blood cells is of great value in appendicitis if made in the first forty-eight hours. In chronic catarrhal appendicitis leucocytosis is absent or is of a low degree. This is true of patients seen at the close of a slight first attack without abscess formation. In case of appendicular abscess counts made at periods varying from one week to one month after the attack showed leucocytosis above twelve thousand in 82 per cent.

Bloodgood says that late in the attack a high leucocyte count is almost positive evidence of abscess, even if the symptoms have subsided. In a very few cases an abscess may exist without leucocytosis. In gangrenous appendicitis the count is usually high, and rises rapidly, for example, from thirteen thousand in fourteen hours to twenty-four thousand in twenty hours after the attack. In another case the count

¹ Loc. cit.

² Loc. cit.

rose from seventeen thousand twenty-four hours after the first pain and vomiting, to thirty-five thousand thirty-six hours after the beginning of the attack. In this case the highest temperature was 100° F., and there was nothing palpable in the abdomen, and no history except pain and vomiting after taking food. Yet a gangrenous appendix, with beginning purulent pelvic peritonitis, was found. In general, a rising leucocytosis is an indication for operation. If the count shows eighteen thousand or more within forty-eight hours of the onset of the attack, an advanced pathological lesion is probably present, such as excessive exudate, gangrene, distention of the appendix with pus, or beginning peritonitis. All of Bloodgood's patients in whom the count showed less than eighteen thousand, or in whom the leucocytosis was decreasing, recovered without operation. After the fourth day of the attack high leucocytosis means abscess or peritonitis. But it is possible to have an abscess without leucocytosis. With peritonitis, too, if the patient is in a septic condition, the count may be low. The prognosis is then a bad one. While there are many points not yet clear the value of blood counts made every four or six hours, especially in the beginning of acute abdominal lesions, is very great.

Curtis said he thought Bloodgood ranked the value of the leucocyte count too high. It is of equal value with the pulse and temperature, but not higher.

Deaver, too, while admitting a value in blood counts, thought their evidence is still so uncertain that the lesson of practical experience at the bedside should not give place to them.

Eliot reports three cases of abscess of the liver in which blood examinations were made, the leucocyte count being in the first case 10,000 to 12,000, in the second case 20,000, and in the third case 16,000 to 19,000.

Topographical Anatomy of the Abdomen. Addison¹ points out that the method of describing the position of the abdominal viscera at present in use is very uncertain. He proposes to divide the abdomen by a median line and by two transverse lines, the lower of which is situated at one-fourth of the distance from the pubes to the suprasternal notch, the upper one being situated at one-half this distance. As the distance from the pubes to the suprasternal notch averaged in forty subjects examined 52 cm. (20.8 inches), these lines are distant from the pubes 13 and 26 cm., respectively (5.2 and 10.4 inches). In the tables which accompany his articles all the distances are based on these figures. In any particular individual the exact measurement of one-fourth and one-half the distance from the pubes to the suprasternal notch would

¹ Lancet, 1901, vol. i. p. 759.

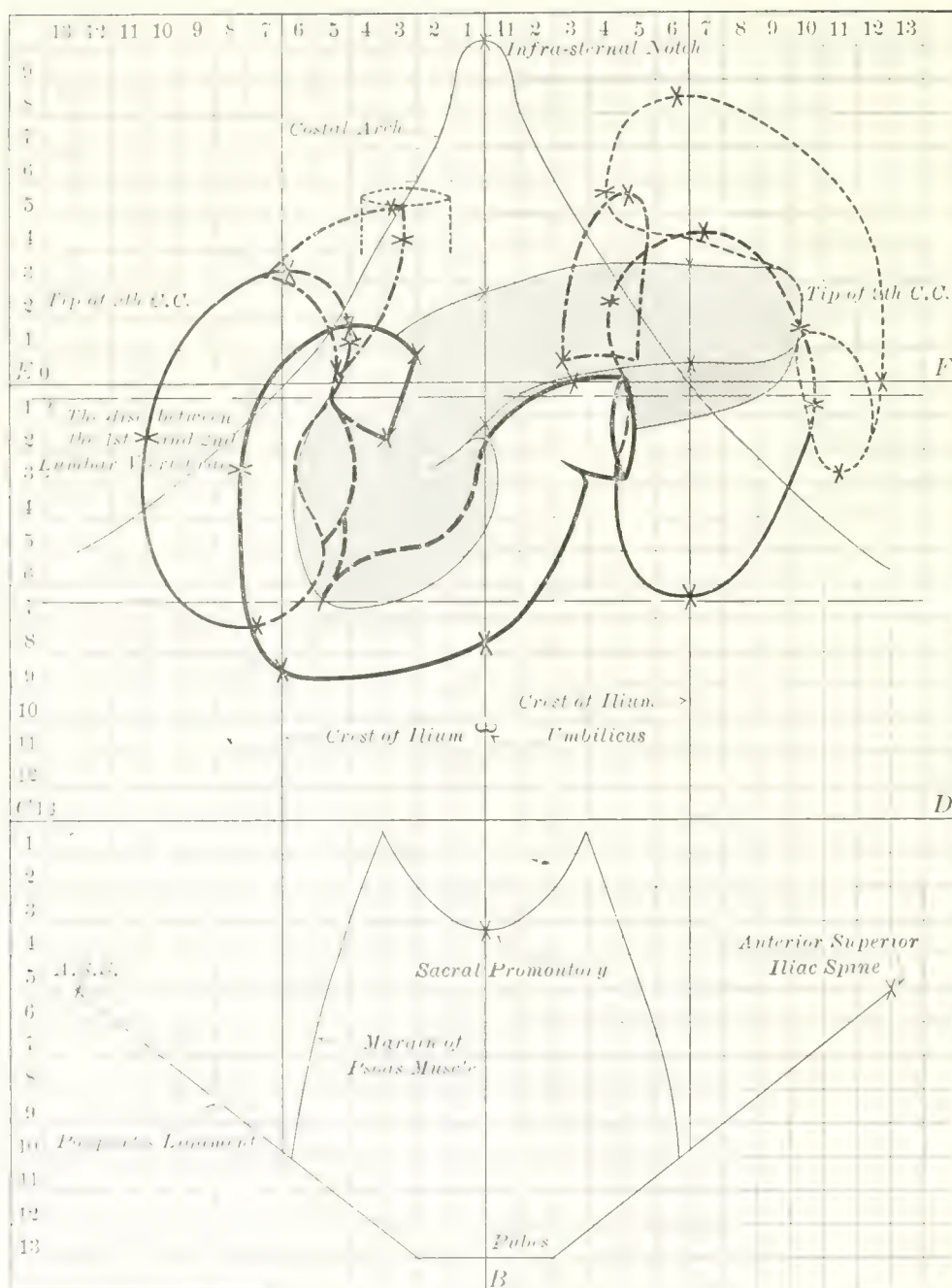
determine the position of the transverse lines. The lower transverse line is just at the level of the crest of the ilia. The upper transverse line usually crosses the costal arch at the tip of the ninth cartilage. Two additional vertical lines bisecting the distance from the anterior superior iliac spine to the median line will also cross the upper transverse abdominal line at the points where it crosses the costal margins.

The value of this method of mapping out the abdomen depends, in the first place, upon its exactness, and, in the second place, upon the fact that the individual varies little from what may be spoken of as the normal chart. The width of the costal arch, however, has been found to vary a good deal in different individuals; hence the method commonly employed of referring to the upper transverse abdominal line drawn from the tip of a certain costal cartilage is not very reliable.

Some of the conclusions reached by Addison in reference to the position of the more important abdominal viscera are worth noting: (1) A highly placed stomach is usually associated with a liver placed well up beneath the ribs, and often small, and with a highly placed transverse colon, which in most cases also is distended. As regards the transverse colon, however, it appears that it may come upward in front of the stomach without appreciably raising the whole stomach, merely pressing it backward into its natural bed. (2) A low position of the stomach—referring to the greater curvature—appears to be especially associated with a liver which extends low down in the abdomen and is perhaps enlarged, and with a low transverse colon. But the transverse colon, by an increase in the length of its mesentery, may sink away from the stomach, which may be supported at its usual level by the small intestines behind the long transverse mesocolon. (3) The liver is clearly chiefly responsible for causing alteration in the level of the pylorus. When the liver extends low down in the abdominal cavity the pylorus is generally situated low, and vice versa. Moreover, allowing for the fact that the part of the liver overhanging the stomach varies considerably in thickness, it appears that mere distention of the stomach, apart from a low position of the liver, is not sufficient to produce material downward displacement of the pylorus.

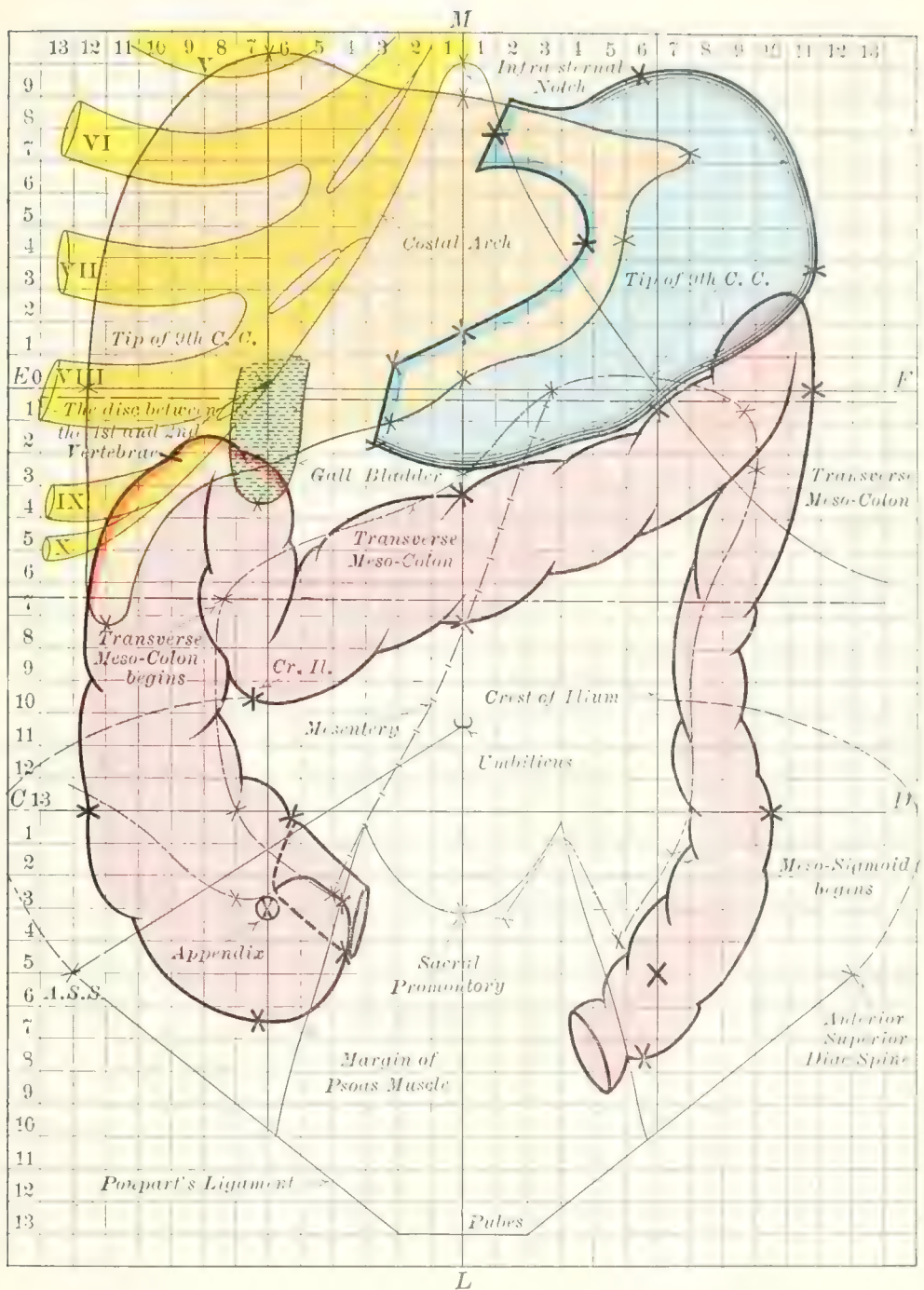
Cure of a Pendulous Abdomen by Operation. Peters¹ reports the resection of a pendulous, fat, abdominal wall, and says that a plastic operation of this character should have a place in surgery. The patient may seek relief from a mass of fat which interferes with locomotion, and gives rise to distressing irritation of the skin in the same manner that a benign tumor, such as a lipoma, would do. The accompanying illustration (Fig. 1) makes a description of the operation unnecessary.

¹ *Annals of Surgery*, March, 1901.



Outlines of the deeper abdominal viscera.

[From drawing by C. W. Smith (Addison), Brit. Med. Journ., March 16, 1901.)



Topographical anatomy of abdominal viscera.

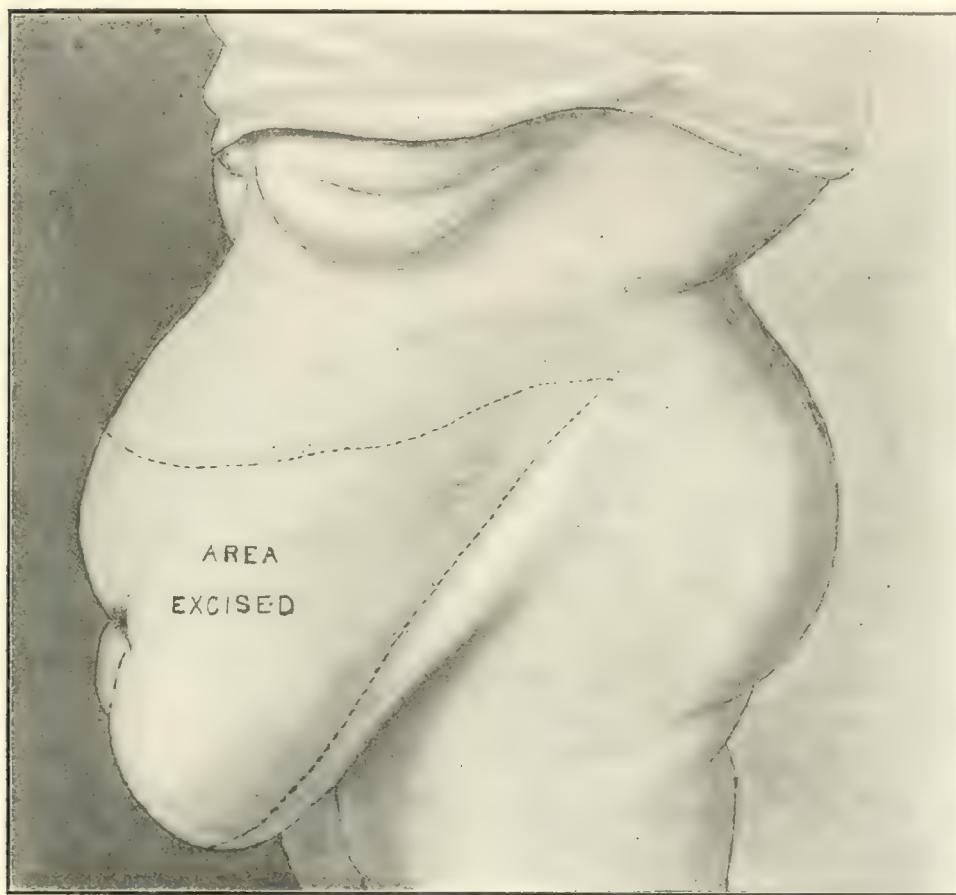
(From drawing by C. W. Smith.)

Lower border of stomach and upper border of transverse colon should be 0.5 cm. lower.

The patient weighed 285 pounds. The section of skin and fat tissue which was removed weighed fifteen pounds. The incision was twenty-one inches long and required fifty-six sutures for its closure. The result was a smooth abdomen. As shown in the illustration, the pendulous breasts, weighing together about twenty-five pounds, had previously been removed.

Heidenhain¹ reports two cases in which he followed Picola's suggestion and reduced the size of the abdominal cavity after the removal of

FIG. 1.



Pendulous adipose abdominal wall. The excised area is included between the dotted lines; the scars of the previous amputation of the immense pendulous breasts are shown.

a large tumor. He incised the wall in the median line from the symphysis to the ensiform process, and doubled the walls over each other like a double-breasted coat. This procedure may also prove useful in abdominal hernia or enteroptosis.

Foreign Bodies in the Abdominal Cavity. This occurrence is as old as abdominal surgery, and, according to Schachner,² it is an accident which will continue to occur as long as abdominal surgery is practised,

¹ Centralblatt f. Gynäkologie (Leipzig), January 4, 1902.

² Annals of Surgery

in spite of any special rules or safeguards. It is interesting to notice, however, on what measures those surgeons now rely who have left foreign bodies in their patients. One of the commonest measures is a special count of sponges and instruments before and after an operation. Another plan is to attach tapes or threads to everything introduced into the abdominal cavity. The tape is then pinned or clamped externally. Some surgeons avoid the use of small pads and artery clamps. Some use as few of these articles as possible. Some attach duplicate numbered checks to their sponges, removing and retaining one whenever a sponge is used. The duplicate number must, of course, be produced at the end of the operation. Other measures recommended are the suturing of drainage-tubes to the wound and the tying together of gauze strips when a number are employed.

It has many times been emphasized that simplicity in the system employed and watchfulness on the part of the surgeon himself are the greatest safeguards.

The legal responsibility of a surgeon to the patient in whose abdomen a foreign body has been left is also discussed by Schachner. In no instance has a suit of this character, in the United States at least, resulted in the conviction of a surgeon.

Schachner's article contains reports of 155 cases, in the majority of which the patient recovered, either because nature succeeded in casting out the foreign body, or because it was successfully removed at a subsequent operation.

If the foreign body is of an aseptic character nature endeavors to encapsulate it and to enclose it by adhesions between different viscera. It may remain unnoticed for years. The disturbance which it causes depends largely upon its shape. If nature makes attempts to expel it, this is usually done either through the wound or through the alimentary canal. The symptoms due to the presence of a foreign body in the abdomen often suggest a low and protracted form of ileus. It is worth noting that on several occasions measures intended to prevent the occurrence of the accident have only complicated matters. For example, a laparotomy pad, with its attached tape and clamp, has several times been left in the abdomen.

Treatment of Raw Surfaces in Abdominal Cavity. Webster thinks that too little attention has been paid to the treatment of raw surfaces in the abdominal cavity after operation. Such surfaces, if neglected, are apt to produce adhesions. Small tears and bare spots should be at once sewed up with catgut. Raw surfaces on the omentum should never be left open, but should be closed by suture; or, if too extensive to be treated in this manner, it is better to resect the affected portion of the omentum. If a raw surface on the bowel is too

large to close by suture, a thin flap should be cut from the omentum to cover it. If the bowel is very badly torn a portion should be resected rather than left in a raw state. A raw surface upon the uterus may be covered by omental grafts, or touched with the cautery so as to form a black char, which is less likely to become adherent than a raw, oozing surface. If the cautery is used upon a raw surface of bowel the touch should be a very light one. When diseased tubes or ovaries are removed there should be no ligation *en masse*, but the vessels should be separately ligated and the stump covered with peritoneum by a catgut suture. If the uterus is extirpated by the vagina the ligatured ends of the broad ligament should be drawn downward and stitched so that the raw stump may be fixed entirely within the vagina. If, on account of adhesions behind the uterus, the raw surface be a large one, the anterior peritoneal layer of the organ may be left, in order to form a flap over the raw surface, and thus complete the perineal pelvic floor. These operations will need gauze drainage through the vagina, since they will always be followed by oozing of blood.¹

Peritoneal Tamponade by Mikulicz's Method. Samter² finds that the treatment of deep abscesses in the abdomen is greatly facilitated by the use of the Mikulicz method of drainage. He mentions several instances in which an abscess with ramifications was changed into a simple cavity and finally healed by cutting down upon the site of the trouble and treating it in this manner. In one case different portions of the abscess cavity were separated from the anterior abdominal wall by normal peritoneal cavity. Instead of crossing this to reach and open the abscess, this portion was shut off from the general abdominal cavity by tamponing it with gauze for a few days before the underlying abscess cavity was opened into. This patient had suffered for a long time with intestinal perforation following upon an appendicitis. The large simple cavity which was formed in the manner mentioned was kept open until the intestinal perforation was cured by cauterization and subsequent granulation. This method of treatment is suitable for deep abscesses in which the intestinal opening cannot be readily found and sutured.

Post-operative Thrombosis and Embolism. At the last meeting of the American Surgical Association Vander Veer³ reported four cases of phlebitis following abdominal operations, one performed upon a man for angioma of the liver, a second for uterine fibroid, a third for double ovarian tumor, and a fourth for appendicitis. All of these patients did well after operation, and the healing of the wound was in each instance

¹ Chicago Medical Record, December, 1901.

² Centralblatt f. klin. Chir., 1901; Appendix, p. 79.

³ Transactions of the American Surgical Association, vol. xix. p. 223.

by primary intention and thoroughly aseptic. There was no prolonged vomiting from anaesthesia or other complication in any case. The first pronounced symptom was pain and a feeling of distention through the limb, followed almost immediately by a rise of pulse and temperature, and a few days later by the local signs of cord-like veins, etc. The surgeon was unable satisfactorily to explain the occurrence of this complication, since there was no pressure on any part of the lower extremities during or after the operation, nor any change from the horizontal position. The loss of blood was in each case slight. Three patients were in good general health, and the fourth, while rather anæmic, was not considered dangerously ill. The left leg was affected each time. Fortunately none of the patients died from the complication, though recovery was delayed in each instance for several weeks.

Fowler mentions occurrences of post-operative phlebitis sixteen times in 2711 cases, or a little over one-half per cent. The trouble was developed in from ten to eighteen days after operation, with an insidious onset, marked by an acceleration of the pulse, with at most a slight rise of temperature and a stiffness and soreness about the lower extremities and some pain along the line of vessels. In most cases sooner or later a certain amount of induration could be felt along the inguinal vessels. Upon these three symptoms he would base the diagnosis. These sixteen patients all recovered, none of them suffering from pulmonary infarction or thrombosis.

Mayo mentioned three cases in his experience in which the pulmonary embolus had occurred, one of the patients dying and two recovering after having been in a very dangerous condition. In both of these two patients the embolism occurred before the symptoms of phlebitis developed, being in one on the fifth and the other the tenth day after operation. In both the heart's action was exceedingly weak, and to this he attributed their recovery.

Lange reported two deaths from pulmonary embolism after the extirpation of large fibroids. Both patients did well for about a week, and then in a few hours succumbed with the characteristic heart symptoms. He considers that the formation of thrombi in such cases is much favored by the slow blood current in the dilated and ligated veins, without the presence of infection. Indeed, a mild degree of inflammation may protect the patient against embolism by causing the thrombus to adhere more closely to the vessel wall.

When to Operate in Perforative Peritonitis. Roper¹ gives four cardinal signs upon which he relies for diagnosis of perforation within the first few hours after it has occurred. They are rigidity, tenderness, the

¹ Lancet, April 20, 1901.

presence of fluid and that of free gas in the peritoneum. One can afford to watch the sthenic patient. His face is possibly flushed; he is alert, and gives the impression of reserve strength, but has no delirium; the pulse may be fast, and even small, but is in accord with the high temperature— 103° to 104° —and has power and tension. The surgeon should, however, have a clear idea as to what he is waiting for, and that is either the resolution of the inflammation without abscess, or the earliest possible moment when the pus can be safely evacuated. The patient of the asthenic type is in a much more critical condition. First there are those who have been allowed to drift through the first and second stages under the influence of opium until they are all but dead from septicæmia. Operation under such circumstances can do no good. But there are also asthenic patients, pale or sallow, with rapid, small, compressible pulse, while the temperature is only slightly raised, or with a low pulse and temperature. If such a patient gives a history of appendicitis, and has the abdomen of peritonitis, he is evidently suffering from profound septic poisoning. Operation under such circumstances is difficult, and the prognosis is doubtful; but the risk of operation is less than that of letting the patient run on to almost certain death. It should, therefore, be performed even if the palpation of the abdomen fails to reveal a definite swelling.

An opiate is usually necessary to relieve the agonizing pain at the beginning of an attack of perforative peritonitis. If possible, make the diagnosis before giving an opiate; if not, give the opiate and see the patient again in four to six hours or less. One may be able after this interval to make a correct diagnosis, and can himself order a further dose of opium if it is necessary.

Treatment of Peritonitis. Robinson's¹ treatment of acute peritonitis is as follows: (1) Give no food or fluid by the mouth, and wash out the stomach if vomiting is active. (2) Keep the patient absolutely still in bed, not allowing him to get up for any purpose whatever. (3) Give small doses of morphine sulphate, $\frac{1}{16}$ grain, at intervals of two to four hours. (4) Apply continued cold to the abdomen by rubber tube-coil or rubber ice-bag, or apply continued heat by means of large corn-meal poultices. (5) To check the thirst employ rectal injections and wet gauze to the lips. (6) No ice should be allowed. Nourish with liquid foods per rectum. Give no cathartics and give the peritoneum time to produce an exudate which will imprison germs, sterilize and digest them.

Wallace² doubts the advantage of introducing strong purgatives

¹ Therapeutic Gazette, December 15, 1901.

² British Medical Journal, 1902, vol. i. p. 452.

directly into the intestinal canal in operations for general peritonitis ; at any rate, his own experience with the method has not been very satisfactory. In one patient who ultimately recovered, half an ounce of magnesium sulphate was introduced into the jejunum, but the bowels did not move for thirteen days thereafter. The constipation under such circumstances is due to paralysis of the gut caused by septic absorption from the peritoneal surface. If this absorption can be stopped the intestines will recover their tone and expel their contents. Patients whose bowels act, as a rule, recover ; but this does not prove that the purgative is the salvation of the patient. It is probable that the bowels act because the patient is combating successfully the septic absorption from the peritoneum.

Post-operative Nephritis. "The Changes of the Kidney After Operations upon the Abdominal Cavity" is the title of a paper published by von Brunn.¹ His observations cover a series of 21 cases, which he divides into three groups :

No. 1, comprising 13 cases. Peritonitis ; necrosis of epithelium of the kidney.

No. 2, 3 cases. Laparotomy ; no peritonitis ; necrosis of epithelium of the kidney.

No. 3, 5 cases. Laparotomy ; no peritonitis ; no necrosis of epithelium of the kidney.

In addition to these there was one patient with carcinoma of the rectum on whom no operation was performed, death occurring as a result of apoplexy ; epithelium of the kidney intact.

He also had an opportunity to examine the kidneys of three dogs (experiments with guinea-pigs remained negative) that had been subjected to operations upon the intestinal tract :

Case I. Peritonitis ; extensive necrosis.

Case II. No peritonitis ; kidney intact.

Case III. No peritonitis ; moderate necrosis.

On the basis of the results of his investigations von Brunn concludes that necrosis of the epithelium of the kidney after abdominal operations almost invariably occurs in connection with peritonitis. It may occur without peritonitis, but in such cases always resembles the microscopical picture that is caused by intoxication of a different character. The manner of its appearance in peritonitis with regard to rapidity as well as intensity shows a great similarity, histologically, to the most serious forms of intoxication of medicinal or other nature known to us.

Laparotomy and Pneumonia. Henle² has made a study of 1787 laparotomies performed in Mikulicz's clinic. This list of cases in-

¹ Archiv f. klin. Chir., 1901, vol. lxx., No. 1.

² Centralblatt f. Chir., July 20, 1901.

cludes herniæ, both strangulated and simple. He found that operation was 143 times followed by pneumonia—fatal in 65 cases. That gives a morbidity of 8 per cent., with a mortality of 3.6 per cent. Most of the cases were of the lobular type. In the majority of instances the pneumonia appeared on the second day, less frequently on the third, fourth, and first day. A most important predisposing factor is the age of the patient. Of over 100 patients upon whom laparotomy was performed at an age between eleven and twenty years 3.4 per cent. developed pneumonia, while of those over seventy years 27 per cent. developed pneumonia. Men were affected somewhat more frequently than women, presumably on account of the greater use of alcohol by the former. In those cases in which gastro-enterostomy was performed for carcinoma the percentage of pneumonia rose to 14, with a death-rate of 9 per cent., while only 9.5 per cent. of those patients upon whom gastro-enterostomy was performed for a benign stenosis suffered from pneumonia, and none of them died. The anæsthetic is undoubtedly sometimes responsible for the pneumonia; but in certain classes of cases, notably after gastro-enterostomy and resection of the stomach, local anæsthesia is more often followed by pneumonia than is general anæsthesia. Henle explains this by saying that while narcosis is somewhat damaging, it is less so than pain, excitement, and weakness of the heart, which are apt to be the accompaniments of a serious operation if only a local anæsthetic is employed.

Of all predisposing causes chilling of the patient is probably the most important. Experiments upon rabbits showed that an animal kept under an anæsthetic for half an hour or even only fifteen minutes would almost invariably die if it was thoroughly chilled during the process by pouring ether upon its body. The lungs were found hyperæmic and œdematous, and showed hemorrhages in the alveoli and loss of alveolar epithelium. Since special care has been taken in Mikulicz's clinic to keep the patient warm during the operation the percentage of pneumonia has gradually declined from 8 per cent. to 10 per cent. in 1898, to 6.6 per cent. in 1899, and 3.6 per cent. in 1900, this last reduction having been accomplished by the giving up of the prolonged washing of the patient upon the operating-table with water, alcohol, etc.

Another important factor is abdominal pain after the operation, since this limits the breathing and interferes with expectoration. Laparotomy wounds which are situated in the median line above the umbilicus are most unfavorable in this respect, and naturally more so in patients whose lungs are in some measure unhealthy. Nature's method of overcoming infection by means of expectoration is then apt to be suspended. Infection may either be introduced through the blood or the air vessels, probably more easily by the latter method. The aspiration of vomited

stomach contents is a frequent and harmful accident, the nature of which is well known.

It was also emphasized that disturbances of wound healing are often associated with pneumonia. The lymph vessels which run from the abdominal to the pleural cavities can very well serve as channels for bacterial infection. In this manner some patients suffer from pleurisy who do not develop pneumonia.

Operations upon the stomach are followed by pneumonia far more frequently than those upon the gall-bladder. This is due to several causes: First, the wound of the stomach operation is so situated as especially to interfere with expectoration, while the intra-abdominal field of operation lies immediately beneath the diaphragm, and thus infection more readily spreads to the root of the lung. These patients further vomit freely, and are often much run down in health. In operations upon the gall-bladder the incision is well to the side, and the intra-abdominal operative field is separated from the diaphragm by the liver. These patients are usually pretty well nourished. It is interesting to observe that cases of incarcerated hernia are more frequently complicated with pneumonia than those of radical operation for reducible hernia; and while the aseptic radical operation for appendicitis was in no instance followed by pneumonia, the much simpler incision of a perityphlitic abscess often gave rise to pneumonia.

The practical results of this study appear in the attempt to shut out as far as possible sources of infection. The patient should be encouraged to breathe deeply and to expectorate freely. He should be told that he can injure himself by coughing. To protect the wound from being torn open the abdominal bandage should press lightly, but not be so tightly closed as to interfere with the breathing. Respiratory exercises are especially desirable after the administration of morphine, which quiets not only the pain, but the desired expectoration. The most important point is the avoidance of cooling the patient. The operating-table should be artificially heated, care being taken to protect the patient from burns.

In the discussion of this article Kronlein said that he had performed laparotomy 300 times, and only once had seen pneumonia follow. He laid stress upon the employment of ether of the best quality and in the smallest possible quantity.

Kummell reported 40 cases of pneumonia, with 29 deaths, in 1070 laparotomies. He insisted upon the importance of frequent changes in the position of the patient in the days following the operation.

Stolper mentioned instances in which pneumonia may follow laparotomy, being caused by fatty embolism. This is a complication which may result from the tearing and bruising of fatty tissue as well as from the severe crushing of bone.

In 960 operations for the radical cure of hernia I have seen but one case of pneumonia result.

Perforating Typhoid Ulcer. Loison¹ admits that the early diagnosis of perforation is a difficult one to make, but the number of times that it has been made previous to operation shows that it is not an impossible diagnosis. The most important signs are the sudden occurrence of intense pain in some spot, whence it radiates to other portions of the abdominal cavity, a rapid pulse, and rigidity of the abdominal muscles over the seat of the trouble. The patient is usually in a worse condition than a patient suffering from perforation of a gastric or duodenal ulcer. Furthermore, it is difficult to make out the perforation on account of the diseased condition of the intestinal wall. There may be two or more perforations at the same time. Each should be sutured; or if the intestinal wall is too diseased to permit of suture a portion may be resected. This will add greatly to the seriousness of the operation. A second perforation may occur, necessitating the re-opening of the abdomen and a second suture. This procedure has been followed by a recovery. Keen collected notes of 167 cases of perforation in typhoid, and found that perforation was single 138 times; while there were 2 perforations in 19 cases, 4 perforations in 1 case, 5 perforations in 3 cases, and many perforations in 6 cases, so that the chance of finding a single perforation is about 82 per cent. Only 5 cases have been reported in which death after operation was due to an additional perforation. The presence of peritonitis is the chief factor in determining the necessity for an operation. The experience gained from autopsies shows that a perforation may be so occluded by intestinal adhesions or by the omentum that no fluid escapes. Such a perforation will not be recognized, and will not demand surgical treatment unless the adhesions which remain give rise to subsequent trouble. If peritonitis becomes evident one ought to operate—the sooner the better, say some operators; but Loison believes that it is wiser to wait a few hours, in order to confirm the diagnosis and to prepare the patient for the operation by injections of ether or caffeine or a saline transfusion. Statistics show that patients who are operated upon within twenty-four hours more often recover than those in whom the operation is longer delayed; but a careful attention to the individual case is more likely to lead to success than a blind following of such arithmetical conclusions. Some patients will have passed the time for operation in eighteen hours, while others may be operated upon with success on the second or even on the third day.

Operation has a double purpose—to close the perforation and to treat

¹ *Revue de Chirurgie*, 1901, vol. xxiii. p. 177.

peritonitis. Spinal anesthesia is especially recommended for the treatment of typhoid perforation. A median incision should be made four or five inches in length, even though the perforation is usually found on the right side. The surgeon standing at the left of the patient rapidly examines the coils of small intestine, sponging them dry and clean. If the perforation does not immediately appear he should begin at the cæcum and inspect the neighborhood of the appendix, while the small intestine is depressed to the left; then the small intestine should be passed through the fingers from the cæcum upward until the perforation is found. The opening is almost always within three feet of the cæcum. When it is found the affected loop of the intestine should be compressed by the fingers of an assistant and surrounded with gauze until the perforation is closed by means of a transverse suture. In certain instances it is necessary to suture longitudinally, but this plan is less commendable. When the suture has been completed the intestines should be further examined for other possible sutures, and also for the purpose of cleansing them by the removal of fluids and fibrinous masses. The abdominal cavity should then be flushed with hot saline solution delivered through a soft rubber tube systematically in the pelvis, the iliac fossæ, the loins, and then above the colon. While this is being done the assistant should raise the edges of the wound in order to permit the surgeon to move about the small intestines. It should not be forgotten, however, that they are markedly diseased, and will not stand too rough handling. Whatever solution does not freely escape should be left in the abdominal cavity. If the wound does not exceed four inches in length it should not be sutured. If it is greater than this, one or two silkworm-gut sutures may be employed to prevent it from gaping too much. The affected coil of intestine should remain immediately under the wound surrounded by a few thicknesses of gauze, and the gauze wick should extend below into Douglas' pouch. No other drainage is necessary. The patient's bed should be warmed and he should be given such stimulants as his condition requires.

Rodman¹ reports an instance of successful operation for perforation of typhoid ulcer occurring in a child aged twelve years. Although the operation was performed at least thirty-seven hours after the perforation, and the patient was in a desperate condition, the recovery was a most satisfactory one. From this experience Rodman draws the conclusion that it is better to attempt closure of a perforation, even though general peritonitis is present. He is also of the opinion that the saving of time when a general anæsthetic is used more than makes up for any

¹ American Medicine, November 23, 1901.

additional shock which it causes. His operation consumed sixteen minutes, and it would have been quite impossible to perform it under a local anaesthesia in so short a time, even if the youth of the patient did not render such an attempt impracticable. The occurrence in this patient of sudden abdominal pain, with a nervous chill lasting twenty minutes, without perceptible increase of temperature, and this on the day preceding perforation, indicates that there may be a pre-perforative stage such as Cushing has suggested. If one could recognize this stage and operate before the contents of the bowel escaped, it would be a distinct gain. Such a fine point in diagnosis is not likely to be reached very soon.

Briggs¹ makes a report upon six cases of perforation in typhoid. He found that the pain came on suddenly in three cases, gradually in two, while the sixth patient was not seen until the attack was well marked. Muscular resistance was prominent in five cases and moderate in six. The pulse was increased from 20 to 50 beats in all of the patients. In three cases there was a rise of temperature of about a degree. The white blood counts showed a distinct rise in five cases. Operation was carried out within a few hours of the perforation in the five cases in which it occurred in the hospital. The technique was essentially that advised by Loison except that the incision was made in the right semi-lunar line. In every instance the perforation was a single one on the free border of the ileum. Two patients recovered, and four died, although only one from general peritonitis. In this instance the operation was delayed eight hours. The cause of death in the other three cases was attributed either to typhoidal toxæmia or to exhaustion.

Ligature of Abdominal Aorta for Aneurism. Dr. Robert T. Morris adds another case of ligature of the abdominal aorta to the 13 previously reported and referred to in our last article. Morris states that all of these patients died, but there is evidence that the operation may be successfully accomplished in the near future. Of this we are not at all hopeful.

Morris states that ten of the operations were done before the days of antiseptic surgery, and almost all the patients died within a few hours of the operation, while of the more recent cases, Keen's patient lived forty-eight days, Tillya's twenty-nine days, and Morris' own case died of septicæmia on the third day.

Morris' paper contains brief notes on all the cases operated upon up to date. A careful review not only of these notes, but of the original cases, will certainly convince the great majority of surgeons, we think, that the patients with abdominal aneurism had better be left in the hands of the physician.

¹ American Journal of the Medical Sciences, January, 1902.

Intraperitoneal Rupture of the Bladder. Alexander¹ gives an analysis of 45 cases of rupture of the bladder treated by laparotomy and suture. These cases are classified as follows :

1. Intraperitoneal traumatic rupture : *a*, simple ; *b*, complicated with fracture of the pelvis or other abdominal lesions.

2. Intraperitoneal rupture from other causes than trauma : *a*, result of disease ; *b*, result of accidental injury during surgical operations.

Although the idea of suturing the bladder was proposed by Benjamin Bell in 1789, the first operation for intraperitoneal rupture, by laparotomy and suture, was performed in 1876, by Mr. Wallet, of St. Bartholomew's Hospital. The patient died. Mr. Heath, in 1879, performed a similar operation with a fatal issue. Bull, of New York, in 1885, and McGill, of Leeds, in 1886, each reported a case with fatal result. The first successful cases were published by McCormac in the *Lancet*, December 11, 1886. He reported two successful cases and described a method of technique which has been generally followed since. By a careful survey of the literature, Alexander has gathered 45 cases treated by laparotomy and suture, of which 23 died and 22 recovered. He believes that with further improvement of operative technique the mortality should be still further reduced. The chief cause of death has been peritoneal infection, to which 12 succumbed ; 2 died of shock, 2 of hemorrhage, and 2 died on the table before the operation was completed. In many cases death resulted from imperfect technique, the suture passing through all the coats of the bladder.

The experiments of Grandchamps on animals have proved that this form of suture is always followed by fatal results.

The effect of the action of normal urine upon the peritoneal cavity has been found to be far less baneful than was supposed a few years ago. In Alexander's table urine has been present in the peritoneal cavity forty, fifty-four, sixty-six, and ninety-nine hours, respectively, without any signs of peritonitis. If the urine already contains pathogenic organisms it is, of course, likely to cause peritonitis within a few hours. The earlier the operation is performed, the greater are the chances of recovery, provided the abdominal cavity is thoroughly cleansed and the wound in the bladder carefully and properly sutured.

As to the causes of rupture, Alexander states that rupture always occurs as a result of direct violence inflicted upon the lower part of the abdomen, and that distention of the bladder at the time of operation is necessary.

¹ Annals of Surgery, August, 1901.

STOMACH.

Hair-cast of Human Stomach. Jacobson¹ reports a most remarkable case of foreign body in the stomach, in a girl, aged eleven years, which was successfully removed by operation. It proved to be a hair-cast of the whole organ, weighing fifteen ounces, and measuring eleven and three-quarter inches along the greater curvature and eight inches in circumference. The illustration (Fig. 2) represents the cast with its

FIG. 2.



Hair-cast removed from human stomach. One-half natural size.

dimensions reduced one-half. The child had been in the habit from very early life of biting off and swallowing the ends of her own hair. Symptoms of vomiting of frothy mucus and other evidences of gastric irritation had existed for more than two years previous to operation. Later constipation became marked, and there was much colicky pain, and a hard, movable tumor was made out. There was rarely any rise

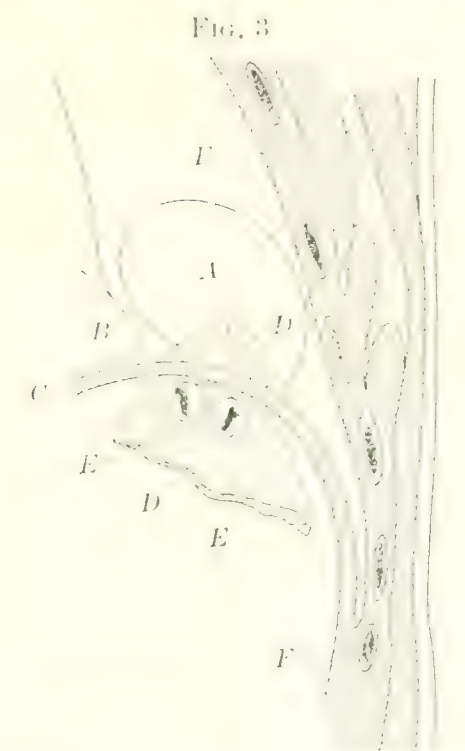
¹ Medical News, February 16, 1901, vol. lxxviii. p.245.

of temperature. That the diagnosis was not made before operation is not surprising.

Strangulation of the Stomach. Mackenzie and Battle¹ report a remarkable case of strangulation of the stomach through a rent in the diaphragm caused by a stab wound received in the left side seven or eight years previously. When crossing the English Channel the patient suffered very much from seasickness, and vomited almost constantly for seven days afterward. His thirst was extreme. The chest was well-formed, but there was marked emaciation. He referred his pain to the upper part of the abdomen, where there was considerable ten-

derness, especially to the left of the median line. The bowels had not moved for six days.

An incision was made under the left costal margin, commencing two inches to the left of the middle line and extending outward four inches. All the intestines, both small and large, were found to be collapsed, and were empty, with the exception of the colon and sigmoid flexure, in which scybalous masses could be felt. The stomach could not be felt at first. The descending colon was found to pass upward beyond the spleen, and was traced to an opening in the diaphragm, from which it was easily withdrawn. To the margin of this opening the omentum was adherent, and none of it could be pulled away. After a continued search for the stomach the pylorus was felt to the inner side of the opening in the diaphragm, and the greater part of the organ which had passed through the opening was released and reduced into



Diagrammatic section of the left chest viewed from the front. *A*. Hernial sac in the pleural cavity. *B*. Pericardium. *C*. Diaphragm. *D*. Omentum passing through the diaphragm, together with *E*. cut transverse colon. *F*. Chest wall.

the abdomen by alternate traction on different parts. There was a distinct mark of constriction where the stomach had been nipped by the margin of the opening, and the part which had been involved in the hernia was thickened, œdematous, and congested. No incision was required, and the stomach showed no tendency to re-enter the space from which it had been withdrawn. (Fig. 3.)

The patient was quickly put back to bed. His pain and vomiting

¹ *Lancet*, December 7, 1901.

ceased, and his thirst was gradually relieved by small quantities of water and large saline enemata. There was temporary improvement, followed by death on the fourth day after operation. At the autopsy a mark was visible on the anterior surface of the stomach, indicating probably the line of its incarceration. The aperture in the diaphragm measured one and one-quarter inches in diameter. There was no true hernial sac, but a false one formed by the omentum. The transverse colon was contained in this sac, but was not strangulated. The lower lobe of the left lung was solid from septic pneumonia.

There have been reported very few instances of uncomplicated strangulation of the stomach, and this case is of special interest as showing the symptoms which are thereby caused. Although the intestine was also found in the hernial sac, it was not strangulated, and probably gave rise to no symptoms. In the case of a recent wound of the diaphragm it may be possible to operate through the chest wall, and so prevent a strangulation. The pneumothorax thus caused adds to the severity of the operation. After the closure of the wound in the diaphragm and the pleural wound the air may be pumped from the pleural cavity. Instances of successful operation of this sort are on record.

Acute Dilatation of the Stomach. Box and Wallace¹ report two additional cases of acute dilatation of the stomach and part of the duodenum, both of them terminating fatally without operation. This interesting and usually fatal malady has often been ascribed to a spasm of the pylorus. The fact that the duodenum, or at least a part of it, may be involved in the dilatation shows that the pylorus is not responsible for the condition. Others have suggested that collapsed intestine, dragging on the root of the mesentery and superior mesenteric vessels, may so compress the duodenum as to cause obstruction. Experiments upon the cadaver do not sustain this theory. The stomach can, however, be enormously distended after the superior mesenteric vessels have been divided and the jejunum has been cut across. The obstruction in such cases is due to the pressure of the stomach upon that part of the duodenum which crosses the third lumbar vertebra. It seems likely, therefore, that the first step in the development of acute dilatation of the stomach is a paralytic condition of the organ, which leads to distention, and that the distended stomach, by pressing on the duodenum in front of the spinal column, actually produces obstruction. This somewhat rare condition has been mistaken for intestinal obstruction, but not infrequently it is accompanied by diarrhoea. The intense abdominal pain, the vomiting, and the excessive

¹ Lancet, 1901, vol. ii. p. 1259.

abdominal distention and marked collapse may closely mimic general peritonitis. It has also been mistaken for uremia, on account of the intense vomiting, partial suppression of the urine, the occasional albuminuria, and the condition of somnolent delirium which precedes the end. Acute dilatation does not necessarily follow operation. If it does so the vomiting may be erroneously ascribed to the anæsthetic and the collapse to the effect of the operation. The essentials of treatment are lavage, followed by a right-sided or prone position of the patient, feeding by the rectum and saline transfusion, and hypodermics of strychnine if necessary.

Thomson¹ has performed autopsy during the past three years in four cases in which death was immediately due to acute dilatation of the stomach, so that the trouble cannot be so rare as has been generally supposed. Twice the dilatation was preceded by operation, once an exploratory laparotomy in the case of carcinoma of the pancreas, and

FIG. 4.



Diagram of shape of stomach in acute dilatation.

once an exploration of a kidney extra-peritoneally. In a third case no operation had been performed, but a soft rubber tube had been passed into a carcinomatous stomach. No operation had been done upon the fourth patient, who suffered from pneumonia and pleurisy of the left side. Thus it will be seen that these cases as well as others previously reported may be conveniently arranged in three classes: First, those in which the dilatation occurs without any apparent cause, and in which after death no other lesion is found; second, those in which after death some other lesion is found; and, third, those in which the dilatation has followed some surgical operation. Some cases have been reported in which acute

dilatation has occurred in debilitated or exhausted individuals as the result of the ingestion of great quantities of improper food. Such cases might well be included in Class 1.

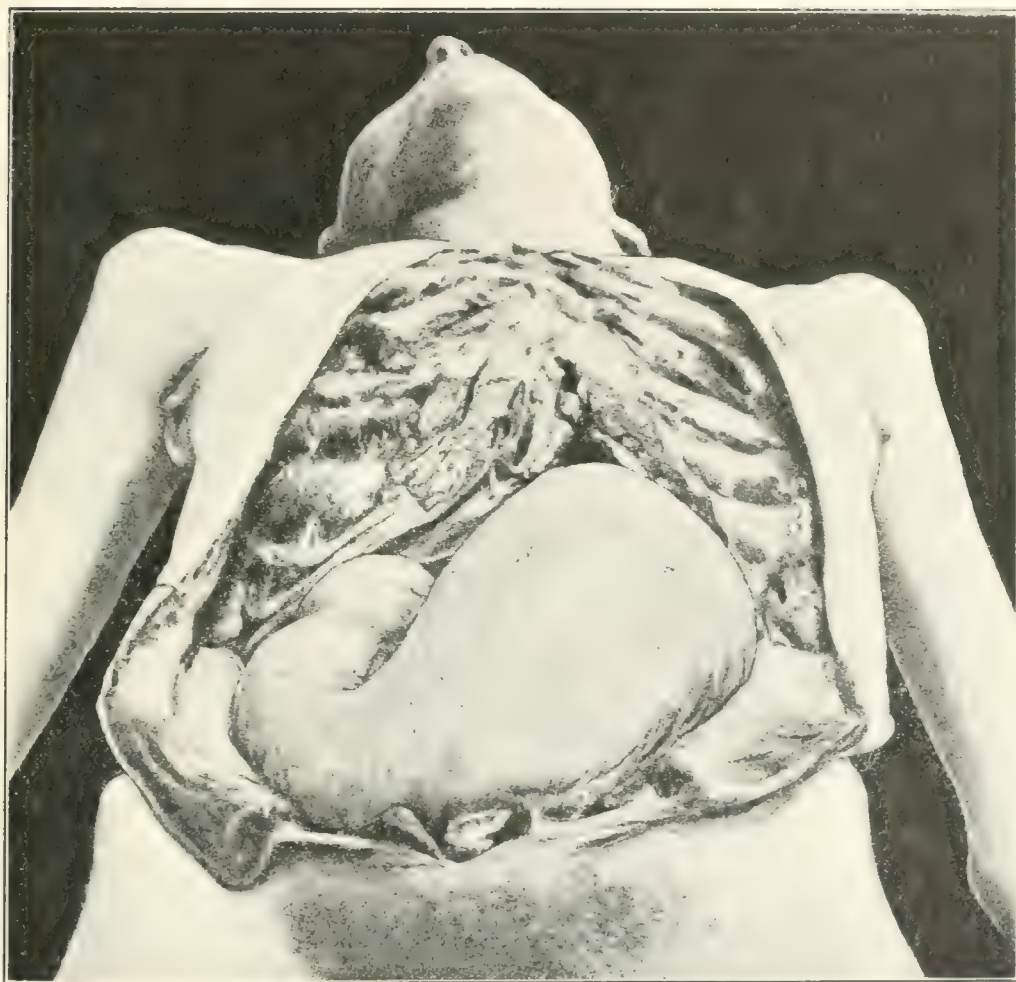
The symptoms of acute dilatation of the stomach are as follows: The distended stomach gives rise to a swelling of the abdomen, especially in the left side and in the lower part. This swelling varies with the vomiting, so that it is not an absolutely sure sign of the trouble. The patient vomits large quantities of brownish or greenish, thin, watery

¹ Lancet, October 26, 1901.

fluid without great effort or distress. There are general symptoms of collapse, with a small, very rapid pulse, frequent respirations, and low or subnormal temperature. There is great thirst, due probably to the excessive vomiting. The appearance of the stomach after death is characteristic. It is shaped like a V, with one limb shorter than the other. (Fig. 4.)

No definite abnormalities have been discovered in connection with the stomach walls. These have not lost their elasticity, as is shown by

FIG. 5.



Acute dilatation of the stomach complicating lobar pneumonia and pleurisy.

the vomiting and also by the contraction which takes place in the stomach after death as soon as the contents are let out. The intestines may be collapsed or distended. (Fig. 5.)

In acute dilatation of the stomach two things are to be considered—the dilatation and the increased secretion. Most observers have hitherto regarded increased secretion as the primary condition, looking upon the dilatation as secondary to it. Thomson thinks that the two conditions, although probably produced by the same underlying causes, are

separate processes, and that the dilatation, at any rate, is not the mere mechanical result of excessive secretion. In some instances there is very little fluid in the stomach and a great quantity of gas. In further support of this view it may be mentioned that in many cases of chronic dilatation due to pyloric obstruction there is a greatly increased secretion, which is obviously secondary to the dilatation.

It may be said that dilatation of the stomach can probably be produced by local interference of the nerves of the stomach, or it may arise after a shock affecting the general nervous system. Such would perhaps be the mode of its occurrence after an operation upon some other portion of the body. It is probably closely allied in its nature to the distention of the intestines which is frequently seen after severe abdominal operations, although it is not at present clear why the intestines should be distended in some cases and the stomach in others.

The treatment of acute dilatation of the stomach has thus far proved unavailing, although the most rational form of treatment—namely, repeated relief of the stomach by means of the stomach-tube, strictly rectal alimentation, and hypodermics of strychnine—has not been systematically followed in any of the reported cases. If the loss of fluid is very great it should be made good by saline transfusion.

Kelling¹ explains the mechanism of acute dilatation of the stomach by saying that there is a passive valvular action, in many individuals, of both the cardiac and pyloric orifices. As a result, if the stomach is distended to the greatest possible extent it prevents the spontaneous evacuation of its contents. This condition is increased by a reduction of the motility of the stomach by narcosis, by local peritonitis—as, for example, after operations for gallstones—and by too firm bandages. Gastropsis is not a predisposing factor. It is often desirable to determine for a particular case whether the dilatation is due to a simple kinking of the duodenum or to some other obstruction in the intestine. This can be ascertained by emptying the stomach with a stomach-tube and then administering such medicine as will produce a rapid evacuation of the bowels. If no fresh bile can be obtained there is obstruction lower in the duodenum. Under such circumstances gastro-enterostomy will hardly give relief. Jejunostomy is a far better procedure, since a gastro-enterostomy may merely result in turning into the stomach bile and pancreatic juice.

Borchard² mentions two cases of acute dilatation of the stomach occurring after gastrostomy, in which the organ was so distended with fluid that its walls were almost as thin as paper. Under such circumstances obstruction in the intestine seems to be secondary. Such a

¹ *Centralblatt f. Chir.*, 1902; Appendix, p. 90.

² *Ibid.*, 1901; Appendix, p. 91.

complication following gastrostomy is heralded by a feeling of pressure and fulness in the abdomen, vomiting being governed by the lesion for which gastrostomy was performed. In order to avoid such a complication it is desirable to make the opening in the stomach as far from the pylorus as possible, so that the distention, if it occurs, shall not be so marked, as observation has shown that the portion of the stomach between the cardiac orifice and the gastrostomy is chiefly affected.

Hour-glass Stomach. Cumston¹ reports two cases of acquired hour-glass or bilocular stomach, occurring in patients of middle life who had suffered from symptoms of chronic gastritis for years, and both of whom were restored to a fair degree of health by operation. In each case the constriction was so situated as to make the cardiac pouch twice as large as the pyloric one. The larger stricture was relieved by a longitudinal incision closed transversely; but the stricture in the other case was too tight for this, and a posterior gastro-enterostomy was performed.

Cumston reviews exhaustively the subjects of congenital and acquired bilocular stomach. While caustics, syphilis, and cancer may give rise to a stricture which shall divide in two the stomach, gastric ulcer is plainly the chief cause of this deformity. The symptoms may be divided into two groups—those due to a long existing or recurrent gastric ulcer and those which arise after the deformity has been produced. These latter symptoms resemble those produced by pyloric stenosis—vomiting of large amounts of food ingested recently or several days previously, occasional hæmatemesis, foul gas, and a constant thirst. As the trouble progresses pain becomes greater, and there will be a feeling of fulness and distention after taking only a small amount of food. There may be marked emaciation and a cachexia simulating that of malignant disease.

Operation should be performed when serious symptoms arise, even if a positive diagnosis cannot be made, gastrostomy being the operation of choice if adhesions do not prevent.

Gastric Ulcer. Robson has at various times made statements in reference to gastric ulcer and its treatment which have excited wide comment. He says that ulcer of the stomach is a much more serious matter than the profession generally recognizes; for, according to various authorities, it has an all-around rate of mortality, when medically treated, of from 20 to 50 per cent. Perforation, he says, is one of the most serious complications, and occurs in about 15 per cent. of all cases of ulceration of the stomach. Recovery from perforation without operation probably occurs only when the stomach is empty at the time of the accident. This is so rare that it cannot be relied upon even then.

¹ Medical News, December 7, 1901.

Hemorrhage from the stomach, the result of ulceration, is a very common event, occurring in 80 per cent. of all cases of gastric ulcer, while the mortality from hemorrhage may be considered to be about 5 per cent. In about one-half of these cases death comes on so rapidly that neither surgical nor medical treatment is of much avail; but in the remaining 50 per cent. of cases where repeated attacks of hemorrhages occur, and where the intervals between the fatal attacks of bleeding vary from a few days to a fortnight, the question of surgical treatment is well worth considering.

THE FREQUENCY AND FATALITY OF GASTRIC HEMORRHAGE. Bramwell¹ takes issue with Robson and other surgeons as to the propriety of operating in gastric hemorrhage "after a second attack of bleeding, even during the course of the hemorrhage, if the patient can stand it, or as soon after as the condition will permit the operation to be done." Bramwell maintains that the adoption of this principle will increase rather than diminish mortality from gastric hemorrhage. He takes this ground because he believes that gastric ulcer is far less common than surgeons assume it to be, and that spontaneous cure follows in much more than 50 per cent. of the cases, and that far less than 11 per cent. of all patients having ulcer of the stomach die from hemorrhage, as some statistics seem to prove. The estimate has been made from the results of large numbers of autopsies that 5 per cent. of the population at some period or other suffer from gastric ulcer. This conclusion is arrived at by adding together the number of cases in which an open ulcer is found and the number in which the scar of a healed ulcer is found; but it is almost certain that many gastric ulcers heal without leaving a perceptible scar, so that probably 5 per cent. is far too small a figure. At any rate, it is extremely difficult to form any accurate opinion either from post-mortem records or from clinical observation as to the number of people who suffer at one time or other from gastric ulcer. The records of several Edinburgh hospitals seem to show that the percentage of patients treated by them for gastric ulcer varies between 0.5 and 1.1 per cent.

In attempting to determine the total fatality from gastric ulcers the difficulties are even greater. Certainly many of the conclusions in published articles are based on statistics, some of which are more than forty years old, and are therefore utterly unreliable as indicating the effect of present methods of treatment. According to Robson's statistics, in a city the size of Leeds (600,000) there should be 81 deaths per annum from gastric ulcer or some of its complications; as a matter of fact, the number actually reported last year was only 18. While

¹ Lancet, March 9, 1901.

such figures may not be exact, the difference between 18 and 81 is sufficiently great to prove the unreliability of Robson's position. Most modern writers, indeed, place the total mortality from gastric hemorrhage at from 8 to 15 per cent. This, again, would give for Leeds last year a total of 23 deaths from gastric hemorrhage, while by liberal interpretation the number did not exceed 8. Here, again, the disproportion is so great that errors of observation cannot wholly account for it. Bramwell himself has treated 127 cases of gastric ulcer, and only two of the patients died from hemorrhage—a percentage of 0.77. If these figures are correct, Bramwell believes operation for hemorrhage from gastric ulcer is not justifiable until death is more imminent than it often is when a patient has simply suffered from two attacks of bleeding. I have personally had one patient die of gastric hemorrhage. This was seven years ago, when operation for gastric hemorrhage was scarcely advocated. This patient had several successive hemorrhages in one week, and died of exhaustion. She had been operated upon for cancer of the breast five years before by Dr. Bull, and was in robust health, with no sign of recurrence. She had never had a hemorrhage before. Autopsy showed a small ulcer the size of a slate-pencil and about an inch long which had eroded a vessel of some size. The patient could have been easily saved by early operation.

During the past year I have operated upon two patients—one for gastric hemorrhage and one for duodenal. In both cases the hemorrhage was repeated and threatened life. I did a gastro-enterostomy, and both patients recovered their normal health, and have had no return of symptoms.

PERFORATED GASTRIC ULCER. Operations for perforated gastric ulcer have become so numerous that they attract little notice unless they have some special features. It has been emphasized from the first that delay in operation is one of the chief causes of fatality. A case described by Parker¹ is a good illustration. A woman, aged twenty-three years, ate a hearty meal of bread and butter, tea and pancakes. Perforation occurred within an hour, and in less than four hours thereafter a small opening was found in the posterior wall of the stomach and excised, and the wound sutured. Recovery was uneventful.

Two cases² are of unusual interest because perforation occurred in sisters, aged sixteen and twenty years, in each instance about three and a half hours after a meal. The ulcer was situated in each patient in the lesser curvature, close to the cardiac end of the stomach. One patient was operated on in twenty-five hours and the other in about

¹ Liverpool Medico-Chirurgical Journal, September, 1901.

² Lancet, February 15, 1902.

five hours. These patients also recovered, although in the former case at the time of operation there was free gas and a large quantity of stomach contents in the peritoneal cavity. The peritoneal cavity was flushed and a drainage-tube was passed into the stomach.

Collins¹ lost a patient through a rare accident. Operation was performed about twelve hours after perforation, and an ulcer of the anterior surface was found and sutured. The stomach contents were removed from the peritoneal cavity as well as the condition of the patient would allow. All went well for several days, until she began to pass partly digested blood by the rectum. Death followed on the eighth day, and at autopsy there was found, half an inch below the pylorus, a large ulcer, which had eroded a good-sized artery. There was no peritonitis, and the sutured ulcer was in good condition.

The length of time which an ulcer may exist without actually causing perforation is shown in a case mentioned by Parker,² in which he operated with success, excising a chronic gastric ulcer which had existed for seven years; the only tissue to prevent perforation was the peritoneum. This patient had been practically disabled by pain during this whole period.

Recovery after operation for perforation of gastric ulcer has been shown many times to depend on a lack of extravasation of stomach contents. Promptness of operation and emptiness of the organ are the chief factors favorable to this condition. Shettle³ reports an instance of successful operation twenty-eight hours after perforation, which ought to encourage those called upon to operate at so late a period, but should in no wise lead to a counsel of delay, since the freedom from extensive contamination of the peritoneal cavity was due to the fortunate fact that the perforation occurred in the anterior surface of the stomach at a point where it was covered by the liver. Adhesions formed early, and so protected the general abdominal cavity. The patient was a girl, aged seventeen years, who had suffered for some time with indigestion, and was anæmic. After a meal of bread and cheese she was sweeping the floor, when she was seized with severe pain in the upper abdomen, followed by fainting, and later general abdominal pain and vomiting. At operation, the following day, the coils of intestine were found glued together, and considerable turbid fluid escaped from the pyloric region. The ulcer was sutured with silk, and the abdominal cavity was sponged clean and drained with cyanide gauze.

Sarcoma of the Stomach. Fenwick⁴ believes that sarcomata constitute from 5 to 8 per cent. of all primary neoplasms of the stomach.

¹ Liverpool Medico-Chirurgical Journal, September, 1901.

Lancet, February 8, 1902.

British Medical Journal, 1901, vol. i. p. 1137.

⁴ Lancet, February 16, 1901.

Many museum specimens which were supposed to be carcinomata have been found upon microscopical examination to be sarcomata. The round-cell sarcomata often run their course in three or four months, though the average duration of life is about fifteen months. The average duration of life in the presence of spindle-cell sarcoma and myosarcoma is about two years and eight months. Death takes place from exhaustion, rarely from perforation, and still more rarely from hemorrhage. The differential diagnosis between sarcoma and carcinoma of the stomach may often be made by attention to the following points: 1. Sarcoma usually occurs before thirty-five years of age, so that the younger the patient the greater the probability that the malignant affection is sarcomatous in character. 2. In many cases there is slight but continuous pyrexia, accompanied by rapid and profound anæmia, while in carcinoma fever is always absent during the early stages of the complaint and the cachexia much more gradual in its development. 3. Simple enlargement of the spleen is by no means infrequent, but is never met with in carcinoma unless the organ is involved in the growth. 4. According to Kundrat, the tonsils are apt to enlarge, and the follicles upon the sides of the tongue may become swollen or ulcerated. 5. Secondary deposits in the skin occur in a notable proportion of the cases, and permit of excision and microscopical examination. It should be remembered, however, that sarcomatosis has been met with in true carcinoma of the stomach. (Leube.) 6. A large nodular tumor due to infiltration of the omentum or a greatly enlarged liver with secondary growths in its substance are rarely met with. 7. Persistent albuminuria is often observed in sarcoma, but is exceptional in carcinoma. 8. The discovery of pieces of morbid growth in the vomit renders the diagnosis certain. (Riegel, Westphalen.)

Wilson¹ reports a case of sarcoma of the stomach which was successfully removed by operation. The tumor was situated in the greater curvature, but extended into the duodenum, so that a pylorectomy had to be performed. The wound in the stomach was partially closed by suture, and the duodenum was fastened into the remaining portion by means of a decalcified bone bobbin. Recovery was uneventful. The tumor weighed half a pound, and had caused the patient comparatively little suffering—a fact which was doubtless due to the absence of pyloric constriction. Sarcomata of the stomach are rare, forming probably not more than one in eight of the malignant tumors of this organ.

Carcinoma of the Stomach. REMOVAL OF THE STOMACH. Bardeleben² reports another removal of the entire stomach, including the

¹ British Medical Journal, 1901, vol. i. p. 1137.

² Deutsch. med. Wochenschrift, April 11, 1901.

pylorus and part of the omentum, for carcinoma. The duodenum was closed and an anastomosis established between the œsophagus and the jejunum. The patient, a woman, aged fifty-two years, was given fluid by the mouth on the evening of the day of operation, and was fed entirely by the mouth from the third day on. Six months later she was reported to be in good health, having gained seventeen pounds.

PYLORECTOMY FOR CARCINOMA OF THE STOMACH. King¹ performed pylorectomy for scirrhus carcinoma upon a patient aged seventy years and six months, partially closing the wound in the stomach and stitching the duodenum into the posterior portion of it (Kocher's method). The condition was a favorable one for radical operation, since both gross and microscopical appearances showed that the growth had not extended to the serous layer. Nine months after operation the patient was in good health and had gained fourteen pounds in weight.

A NEW METHOD OF GASTROSTOMY which ought to insure a permanent fistula of good calibre is described by Depage.² In the anterior curvature to the left of the middle of the stomach a U-shaped incision is made, the sides of the U being far enough apart to allow the flap so formed to be wrapped around a rubber tube. The edges are sewed around such a tube, which extends from the stomach to the surface of the abdomen, and the gap in the anterior wall of the stomach is also closed by sutures. Thus there is a long, continuous suture line extending from the point in the stomach where the tip of the flap was cut to the tip of the flap wrapped about the rubber tube. This artificial œsophagus, as it were, is lined with mucous membrane throughout. Contraction in its lumen is therefore most unlikely. When healing has taken place a tube may be easily and painlessly passed in for feeding the patient.

Bacteria in the Stomach. Cushing and Livingood³ found that it is quite possible to render the stomach and upper part of the small intestine amicrobic as a preliminary measure in operations upon these organs. Numerous observations upon animals show that there are no bacteria which are regularly found in the stomach or upper part of the small intestine, but that germs of various sorts are introduced by the food, and are able to multiply and live for a longer or shorter time, according to circumstances. In striking contrast is the condition of the lower part of the small intestine, in which there are always hordes of bacteria. In the large intestine there is a constant though much smaller number than in the ileum. In animals which take only clean

¹ Medical Record, May 11, 1901.

² Journ. de Chir. et Annal. de la Soc. Belg. de Chir., November and December, 1901.

³ Johns Hopkins Hospital Reports, vol. ix.

food, for example rabbits, the duodenum is often sterile without especial precautions being taken.

A further practical point is the fact that in health the mucous membrane of the intestine is amicrobic, no bacteria having been found by the investigators in the mouths of the mucous glands or in the recesses

FIG. 6.

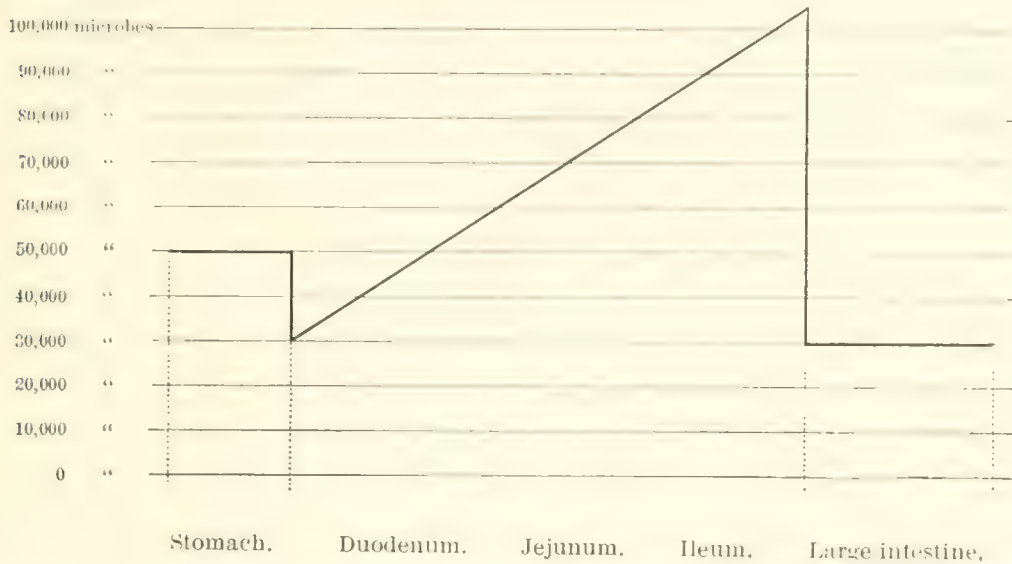


Diagram of Gilbert and Dominici, showing the relative number of micro-organisms in the dog's intestine two or three hours after a meal. (Société de Biologie, Séance du 19 février, 1894.)

FIG. 7.

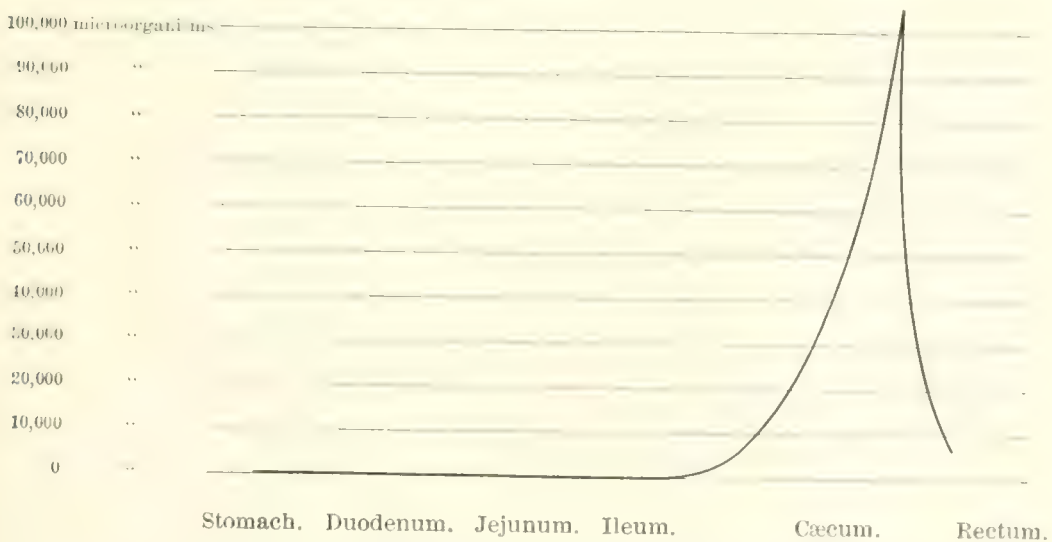


Diagram showing the relative number of micro-organisms at different levels of a dog's intestine after a prolonged fast.

of the deeper layers. This being the case, it is fair to assume that the stomach might free itself from bacteria if no additional ones were introduced by swallowed saliva or food. Such an amicrobic condition was found upon microscopical and cultural examination of the inner surface

of the stomach in five cases of gastrostomy performed upon patients who had fasted for many hours. In three cases of jejunal fistula in which the digestive products wholly escaped by the proximal loop of a fistula, and the distal loop had not been used for feeding purposes, the mucous membrane of the distal loop was found to be sterile at a little distance from the fistula. These facts are strikingly brought out by the accompanying diagrams (Figs. 6 and 7), which show the relative number of micro-organisms in different portions of a dog's intestine after a meal and after a prolonged fast.

In man it is undoubtedly true that the ordinary preparation for anæsthesia, with a limited diet for several hours, leaves the stomach and upper part of the intestinal canal free from bacteria, provided the mucous membrane is normal. Even in pathological conditions—gastritis from ulcer, carcinoma, dilatations, etc.—tests made by the investigators showed that the very bacteria which had been fostered by the pathological state could sometimes be entirely driven out of the stomach and upper bowel. The procedures recommended to accomplish this desirable end consist chiefly in attempts to make all ingesta sterile. The mouth is rinsed with an antiseptic solution and the teeth are brushed at intervals of a few hours, and especially before and after each feeding. The stomach is washed out morning and evening if catarrh exists and micro-organisms are present. Food is taken in small amounts at frequent intervals from sterile vessels, and consists of boiled water, sterilized milk, beef-tea, albumin-water, and similar liquids. Patients with chronic gastritis have been known to gain under this regime. From six to ten hours before operation nothing is given by the mouth, recourse being had to rectal feeding if necessary. As peritonitis following intestinal wounds, operative or accidental, is dependent for its characteristics upon the bacterial flora of the canal at the site of the lesion, the prognosis of such conditions will be favorable proportionately with the scarcity and innocuousness of the micro-organisms which are present.

Gastro-enterostomy. McGraw mentions two instances of “vicious circle” after gastro-enterostomy—one confirmed by autopsy and the other by a second operation, the distention of the afferent loop of the duodenum being overcome by an anastomosis with the efferent loop by means of a Murphy button. It has been shown by Kelling that a full duodenum may inhibit gastric contraction, even when the way is open for the gastric contents to pass into the efferent loop of the intestine. McGraw therefore recommends entero-enterostomy in connection with gastro-enterostomy in all cases. Some of those who have previously come to the same conclusion have found, however, that a multiplication of anastomoses is no sure preventive of bilious vomiting. The editor

of this article knows of an instance in which this additional anastomosis was made, and the vomiting was so long and severe that the surgeon thought that the entero-anastomosis was not working properly. He therefore reopened the abdomen and made a second entero-anastomosis, as the afferent limb of the duodenum was found moderately distended. The patient survived, but passed only one of the three Murphy buttons, and about a year later his distress and attacks of vomiting were so pronounced that for a third time the abdomen was opened and the remaining buttons removed from intestine and stomach. They had not shifted their positions, except that the spring of the one used in the gastro-enterostomy had completely rusted away, and half of this button had fallen back into the stomach. McGraw strongly objects to the practice of twisting the jejunal loop before attaching it to the stomach. The idea of making the current in it run parallel to that of the stomach is a pure fancy, and the twist in the loop may apparently prevent the easy emptying of the stomach. He insists on the selection of a loop of jejunum far enough away from the duodenum to afford ready movement, and says that the opening of the anastomosis should be at least two inches long. In the matter of technique he advocates the elastic ligature.

Oscar Kaiser¹ publishes a very comprehensive paper on the results of gastro-enterostomy as observed at Kocher's surgical clinic at Bern up to the end of 1899.² The report comprises 48 gastro-enterostomies, 33 having been done for malignant, 15 for benign disease; 19 of the malignant cases were men, 14 women. The ages of these patients ranged between 36 and 61 years; 13 were between 50 and 60 years of age, 18 between 40 and 49. The two youngest patients (women) were thirty-six years of age, and in these the carcinomatous infiltration of the stomach was particularly extensive.

As regards the methods employed, posterior gastro-enterostomy retro-colica was done in 7, anterior antecolica in 24 of the malignant cases; the retrocolic anterior method was employed twice. The Murphy button was used in only 4 instances.

Regarding the technique of the operations done, we are referred to Kocher's *Operationslehre*, fourth edition, now in press.

Twelve (36.3 per cent.) of the carcinomatous patients died soon after from causes more or less closely connected with the operation. (Stendel, Carle, and Fantino, 40 per cent.) In 16 of the remaining cases it was possible to obtain the dates of death. They were as follows:

¹ Deutsch. Zeitschrift f. Chir., 1901, vol. lxi. p. 290.

² The latest literature on this subject is not taken into consideration in this article, since the same was completed two years ago, but was held by Kocher, who intended to make an addition regarding the technique, but after all did not find the time to do it.

1 weeks after operation	.	.	.	.	.	.	1
6 to 7 weeks after operation	.	.	.	.	.	.	4
10 " "	.	.	.	.	.	.	1
3 to 4 months after operation	.	.	.	.	.	.	8
8 and 12 " "	.	.	.	.	.	.	2

The average duration of life after operation was from three to six months. Stendel in reporting Czerny's cases gives the average duration of life as from seven to eight months. "Our seemingly low figure," Kaiser states, "may possibly be due to the fact that we do resection wherever at all possible, so that only the most unfavorable cases remain for gastro-enterostomy."

The immediate functional result was good in two-thirds of the 21 cases traced; in 18 of these the operation was according to Wölfler, with good functional result in 9. In 2 of the 3 cases in which von Hacker's method was employed the immediate functional result was good. In only one of the cases in which Murphy's button was used could the same be said to have been a decisive factor in an unfavorable sense.

The stomach contents were observed to turn sanious in consequence of regurgitation in 6 (23.1 per cent.) of the 26 cases in which the anterior method was employed and in 1 (14.3 per cent.) of the 7 in which the posterior method was used. Excluding from the foregoing 26 cases of carcinoma 2 in which the retrocolic anterior method was employed and 1 case in which a technical error apparently was the cause of the unfavorable result, we have 17.3 per cent. with regurgitation after Wölfler's method.

"It is rather difficult," Kaiser states, "on the basis of the material on hand to decide in favor of one or the other method." He does not share the view of Stendel-Czerny, who greatly prefer von Hacker's method.

Carle and Fantino consider the posterior operation preferable in serious cases of carcinoma where the contractility of the stomach is much impaired, while they prefer Wölfler's method for benignant diseases of the stomach. They both use Murphy's button, however.

Mikulicz has returned to the anterior method, as he believes it equally efficient and simpler to perform.

Hahn and Siegel likewise give Wölfler's method the preference.

Kocher does not see any reason for changing his opinion that the establishment of a fistula in the anterior wall of the stomach is entirely capable of producing good functional results, especially in connection with his method of perpendicular apposition of the loop of intestine and his mode of establishing the opening immediately above the large curvature—that is, the lowest portion of the stomach when the patient assumes an erect posture.

With regard to benign cases, Kaiser reports 15 cases treated by gastro-enterostomy. In 7 of these gastro-enterostomy antecolic anterior was done, in 5 retrocolic posterior, and in the remaining 3 Roux's method "en Y" was employed. In 9 cases the result was very gratifying; in 3 the stomach trouble was considerably improved, and in 2 very little benefit was derived from the operation. These latter, however, Kaiser thinks, should really be considered separately, since the lesion was evidently complicated with other diseases. In the 9 cases with good result 3 patients were operated upon by the anterior, 4 by the posterior, and 2 by Roux's method "en Y."

In the 3 cases of the second group the antecolic anterior operation was performed, and of the 2 in which but little benefit was obtained 1 patient was treated by the retrocolic posterior and 1 by the antecolic anterior method.

While a comparison of methods may hardly be permissible, in view of these limited statistics, Kaiser believes that, on the whole, equally good results as regards general condition of the patients were obtained by the anterior and the posterior methods. He does not believe that the results of Roux's method can be said to be particularly better than those obtained by the simpler procedures.

Terrier¹ reports one death in fifteen cases after gastro-enterostomy. This operation was performed seven times on account of carcinoma, the patients living from four to eleven months. It was performed eight times on account of gastralgia with excess of hydrochloric acid, on account of simple dilatation or dilatation with pain, on account of excess of hydrochloric acid, and for ulcer, for gastro-succorrhœa, and for alcoholic gastritis.

Monprofit claims that chronic affections of the stomach all demand surgical intervention. He says there is no such thing as effective medical treatment. Pantaleoni is an advocate of Roux's "en Y" gastro-enterostomy for all affections of the stomach not exclusively dependent upon the nervous system. The symptoms after gastro-enterostomy which are attributable to a vicious circle are often merely the results of slight adhesions between some of the loops of intestine and the abdominal wall.

Preparation of the Patient for an Operation upon the Stomach, and the After-treatment. The cases which go wrong after operation upon the stomach usually do so on account of infection or collapse or stagnation of the stomach contents. Stieda² discusses these various symptoms and the means for preventing and combating them. Infection is to be prevented by washing out the stomach before operation.

¹ *Revue de Chir.*, November, 1901.

² *Archiv f. klin. Chir.*, vol. lxxiii. p. 715.

If there is a slight degree of insufficiency, two washings—one on the evening before the operation and the other one an hour before the operation—are usually sufficient. The patient receives a fluid meal early on the day of the operation, milk being avoided on account of the troublesome coagula. If there is a marked retention of stomach contents it is necessary to begin the washings many days before the operation. An exception must be made in those patients in whom recent hemorrhages have taken place, on account of the danger of renewing the hemorrhage from an old ulcer. If the water returns mixed with blood the lavage should be cut short for the same reason. Moreover, such a patient is more apt to suffer from hemorrhage after the operation than from infection, since the stomach contents have probably become very dilute.

A considerable number of patients operated upon die of collapse, which is not to be wondered at, considering the wretched condition in which many of them are at the time of operation. This collapse is due in part to the deprivation of nourishment after operation and in part to the auto-intoxication which takes place from the stasis. The collapse is to be avoided, in the first place, by building up the strength of the patient as much as possible before operation, while special attention is to be given to free administration of fluid and nourishment either during or after the operation. The amount of nourishment taken by the mouth before operation should be limited, while saline injections and nutrient enemata, and even subcutaneous infusion, should be administered to keep up the patient's strength. In every case, on the evening before operation, or even one or two hours before the operation, the patient should receive a pint of saline infusion by the rectum. The same amount should be given on the evening after operation, to be followed by the regular nutrient and saline injections or subcutaneous infusion until all danger of administration by the mouth has passed. The quantity of urine is usually a reliable sign to indicate whether the patient is getting sufficient fluid. If these measures are followed a patient will withstand a complete withdrawal of fluid by the mouth for a considerable time.

The duration of narcosis should be made as short as possible in case of weak patients. The anæsthetic should be given on the table after every detail is complete, the operator and his assistants having been fully disinfected. The first incision can be made soon after the administration of the anæsthetic is begun. Stieda does not recommend cocaine spinal anesthesia, fearing the danger of intoxication in a weakened patient. He emphasizes the necessity of a warm operating-table and warm clothing. It is often necessary to choose the simplest operation. This is probably jejunostomy, with an oblique fistula. According to

Witzel, it can be rapidly performed, and has the advantage that the intestine is only opened at a single point, so that the risk of infection is reduced to a minimum. Moreover, the operation can be carried out under Schleich's anæsthesia.

The chief danger after an operation upon the stomach is the stagnation of the stomach contents, which may increase until *circulus vitiosus* is fully developed. This has usually been explained upon mechanical grounds, and new methods of operation are constantly sought in order to avoid it; but the history of cases shows that it exists many times without any mechanical obstruction. Indeed, at autopsy one often sees a large dilated stomach, while the afferent and efferent parts of the intestinal loop contain almost an equal amount of fluid, so that it is absolutely impossible to look upon the obstruction as due to a kink in the intestine. The chief explanation of these cases is that there is a failure of motor power in the stomach. This may exist before operation, but is usually the result of the operation. Acute gastrectasis sometimes follows other operations—for example, one for gallstones. Such a condition is heightened if the operation be upon the stomach, and by reason of the gastro-enterostomy a considerable quantity of bile is poured into the stomach. The stomach is then not in condition to drive out its contents, and dilatation occurs. Such an atony is apt to increase. To avoid this dangerous stagnation of the stomach Braun proposes entero-anastomosis in combination with gastro-enterostomy. This is intended to prevent the bile from flowing into the stomach, and thus to relieve it of the necessity of forcing the fluid into the intestine. Unfortunately, results show that this is not a sure preventive of the trouble, while it is in many cases, at least, an unnecessary complication of the operation. Roux's "en Y" method of gastro-enterostomy (PROGRESSIVE MEDICINE, 1899) is preferable to Braun's. The best means to prevent gastric distention is to give the patient as little fluid as possible by the mouth for some days after the operation, and to supply the necessary fluid and nourishment by the rectum. Vomiting during the first twenty-four hours is of little significance, but if it continues beyond this period, and becomes dark brown or greenish in character, the patient should be most carefully watched lest the dreaded gastric distention takes place. Absolutely nothing should be given by the mouth, and the stomach contents should be drawn off by a soft rubber tube. It is better not to irritate the stomach, though, if the fluid contents do not escape of themselves through the tube, siphonage may be established by the filling of the tube with water. One should be careful not to pass more than 40 cm. of tube through the teeth. If these measures are followed out the threatened atony will often pass over. If it does not do so one may perform a gastrostomy, passing

the catheter through the stomach into the jejunum, or an entero-anastomosis may be added to the original gastro-enterostomy.

As good and bad results have been obtained by both the retrocolic and enterocolic methods of gastro-enterostomy, it would appear that the exact situation of the fistula is not of special importance.

There is little that one can do in cases of post-operative hemorrhage. Such hemorrhages usually come from an ulcer existing prior to the operation, although they may be the result of an ulcer due to an unwise clamping of the stomach or to thrombosis of the stomach due to ligated or clamped mesenteric vessels. Careful operative technique is rarely followed by a post-operative gastric hemorrhage. Post-operative pneumonia is greatly to be feared in weakened patients. The binder should be removed as soon as possible and the position of the patient changed from time to time. The air of the sick room should be free from dust, and the patient should be urged occasionally to take a few deep breaths.

In the treatment of post-operative peritonitis little is to be hoped for from secondary laparotomy. Stimulants, rectal alimentation, and subcutaneous infusion may enable the patient to withstand the acute attack. If they do one should not be in too much of a hurry to open circumscribed abscesses.

Elevation of the foot of the bed is said to be of value in tending to prevent formation of thrombi in the veins of the lower extremities.

DUODENUM.

Duodenal Ulcer. Moynihan¹ treats the subject of duodenal ulcer, acute and chronic, in an exhaustive manner. He finds that the ulcer is generally situated in the first portion of the duodenum, and may occur at any age. It is more frequently found in men than in women. He believes that there is often a co-existence of gastric and duodenal ulcers, which further confuses the none too clear diagnosis. The cardinal symptoms are pain in the epigastrium or right hypochondrium, coming on an hour or so after eating. Hematemesis is an occasional and rather erratic symptom, and melæna, too, is observed in only 15 per cent. of sixty recorded cases. Examination of the stools of the patients is so much neglected that the true percentage is probably considerably higher than this. As in ulcer of the stomach, good results after operation depend chiefly upon the time which has elapsed since perforation, upon the amount of extravasated food, and upon the speed with which the operation can be completed.

¹ *Lancet*, December 14, 1901.

Carcinoma of the Duodenum. Rolleston¹ has investigated the subject of malignant disease of the duodenum, which he finds occurs rather more frequently than cancer in the lower part of the ileum. Primary cancer in any other portion of the small intestine is almost unknown. Among 42,000 autopsies in Vienna malignant disease of the intestine occurred in 443, the duodenum being affected only 7 times in 1800 autopsies. At Guy's Hospital there were found 10 cases of primary malignant disease of the duodenum in 18,000 autopsies. Carcinoma is more common than sarcoma. In 51 cases which Rolleston was able to collect the average age of the patient affected was found to be fifty-two years. The males predominated in the proportion of three to one.

Carcinoma of the duodenum gives rise to a different group of symptoms, according as the growth is situated above the biliary papilla, at the papilla, or below it. If it is above the papilla the clinical picture is essentially that of pyloric carcinoma. This is the condition found in about one-third of the cases. In one-half of the cases, or more, the carcinoma is situated at the level of the biliary papilla. This will give rise to interference with the flow of bile, although as a rule the flow is not completely checked; therefore the jaundice may be intermittent, and not permanent and progressive as in carcinoma involving the common duct, the cavity of the ampulla of Vater, or the head of the pancreas. Another change which frequently follows carcinoma of the biliary papilla is suppurating inflammation of the bile-ducts, which may kill the patient in a short time. If the carcinoma is below the biliary papilla it will, by narrowing the lumen, give rise to obstruction, with bilious vomiting. The obstruction will usually be intermittent, and the symptoms will therefore be similar to those of pyloric carcinoma plus the bile and pancreatic juice in the vomit. The presence of these fluids in the vomit ought always to suggest carcinoma of the duodenum below the biliary papilla.

OMENTUM.

Plastic Use of the Omentum. The use of the omentum to supply defects in the peritoneum or to strengthen weak spots in the stomach or intestines is not a new procedure; but it is only in the last year or so that a more careful study of this subject, founded upon numerous experiments upon animals, has been able to place it upon a firm basis. The better to show what can be accomplished in this manner, Hermes² cites these two cases: A woman, aged thirty-three years, much emaciated, was operated upon for stenosis of the pylorus due to ulcer. A

¹ Lancet, April 20, 1901.

² Deutsch. Zeitschrift f. Chir., 1901, vol. lxi. p. 545.

defect in the wall of the stomach an inch or more in diameter could not be satisfactorily closed by suture, since the stitches cut through the diseased tissue. The omentum was stitched over this bad suture, and gastro-enterostomy was performed. The patient died in ten days of double pneumonia. The abdomen was free from any inflammation, and the incision into the stomach was quite healed. In another patient the stomach was found closely adherent to the abdominal wall by reason of a cancerous growth. In making a separation the surgeon tore a rent in the stomach 2.5 inches long. Here, too, the stitches held badly on account of the infiltration of the gastric wall with the disease. The omentum was used to protect the suture. The patient made a good recovery, dying some months later of marasmus.

A second indication for the plastic use of omentum is the employment of a Murphy button under circumstances in which the peritoneal cavity is to be drained with gauze. A fecal fistula due to the too early cutting through of the button may be avoided by the use of an omental covering.

Even more remarkable is the use of omentum to fill a gap in the stomach wall. Braun and Bennett have both done this successfully in operations upon patients, while others have studied the subject by experiments upon animals. Their conclusions are worth repeating in this connection. Tietze says that omentum will heal in either an artificial perforation of the stomach or in one due to ulceration. The side of the graft toward the stomach adheres to the serosa, inflames and undergoes cicatricial contraction, and finally becomes covered with epithelium from the edges of the ulcer; but this epithelial covering is never as perfect as the normal epithelium of the stomach. Enderlen says it is possible to close defects in the stomach by omentum. A defect made experimentally will grow smaller on account of gastric contractions and on account of cicatricial shrinkage. The transplanted omentum becomes covered with a tall cylindrical epithelium. In about six weeks a development of glands (the fundus or peptic glands) takes place. They present a variety of shapes and sizes, but in sections made up to a period of eleven weeks after operation there has never been observed the formation of chief and parietal cells which is so characteristic of the normal glands of the fundus.

Defects in the intestine can also be made good by the omentum, the processes of repair being similar to those mentioned in connection with the stomach. Hermes cites an instance in which he closed a gap in the lower part of the sigmoid flexure or upper part of the rectum by means of the long omentum. The necrosis of the bowel wall in this case was due to a suppurating ovarian cyst. The patient made a good recovery, and a year later showed no signs of damage referable to the genital

organs or alimentary tract. It is well known that such defects may heal spontaneously after a long interval if the discharge is drained or of itself finds a way of escape. But such a process is tedious, and the healing may not be perfect; hence the use of omentum to bring about a more certain and speedy repair is a distinct step in advance. Hermes thinks that, in spite of thorough cleansing of the affected parts, a gauze drainage is usually necessary. It may, indeed, take the place of sutures, and hold the omentum so firmly in position that no leakage of gastric or intestinal contents occurs.

Wounds of the Gall-bladder Closed by Transplanted Omentum.

In an article entitled "The Healing of Wounds of the Gall-bladder and the Covering of Defects of the Gall-bladder by Transplanted Omentum," Enderlen and Justi¹ give a detailed account of their experiments upon rabbits and dogs.

The experiments as to the healing of wounds of the gall-bladder were made with rabbits. The technique was very simple: Incision parallel to the right costal arch, exposure of liver with gall-bladder, loose ligation (without division) of the bladder, incision, Lembert's continuous suture, and closure of the abdominal wound. The animals were killed after varying intervals of time, and on autopsy an attempt was made in every case to fill the gall-bladder with fixing fluid (sublimate, 6 per cent. Müller formol), in order to better survey the results.

Macroscopically, the picture that presented itself was frequently this: The lobes of the liver had moved closer to the gall-bladder, which was enveloped in granulation or connective tissue. In some instances intestine was found to lie on the gall-bladder, in others the omentum, and, according to the interval that had elapsed, they were more or less adherent.

The changes resulting after the various periods of time were, briefly:

Autopsy performed one day after the intervention showed extensive necrosis, especially in the inverted edges of the wound. Peculiar to note were the short strips of epithelium (with well-preserved cells) that were found to lie on the necrotic tissue. There is no sign at this time of regenerative processes.

The conditions found three days after operation were: Comparatively extensive new formation of epithelium; regenerative processes in the muscularis not very marked, more so in the connective-tissue cells; extensive degeneration in the region of the wound.

Still further advance in the formation of epithelium and increase of the granulation tissue and capillaries was observed four days after operation, while there was no appreciable change in the musculature.

¹ Deutsch. Zeitschrift f. Chir., 1901, vol. lxi. p. 235.

Seven days later the increased new formation of epithelium, as also of connective tissue and capillary proliferation, with decrease of leucocytes as compared to the fourth day, was considerable.

Twenty-one days after operation the bladder was found fully covered by the adjacent lobes of the liver, only a narrow furrow between the two latter indicating its position. The bladder was distended and contained a good deal of apparently cast-off substance.

On the whole, it may be said that while autopsy showed the lumen of the bladder to exist, epithelial formation was incomplete owing to the inadequate evacuation of the cast-off masses.

IN THE TRANSPLANTATION OF THE OMENTUM upon defects of the gall-bladder small dogs were used, the omentum of cats and rabbits being too thin, generally, for this purpose. Enderlen and Justi proceeded in the following manner: In two of the dogs a piece of gall-bladder was extirpated after loose ligation of the bladder; the omentum was then sutured over the defect in a double layer. In two other cases the operation was performed without ligation of the bladder, and absolutely no disturbance in the general condition of the animals was observed to follow.

Summarizing the results obtained from these experiments, the authors found that an artificially created defect in the gall-bladder decreases in size on account of the contraction of the musculature. The mucous membrane, which has become too large, so to speak, for the foundation, protrudes. It first covers the periphery of the omentum transplanted upon the defect. It was further noticed that in those portions of the omentum which lie toward the lumen of the gall-bladder necrosis sets in, while in the lower part (toward the peritoneum) a great increase of connective-tissue cells, a moderate infiltration of leucocytes, and, on the seventh day, new formation of capillaries takes place. From the border of the mucous membrane an abundant formation of epithelium starts, which at the end of the first week extends pretty far upon the transplanted omentum.

In the further course the degeneration and inflammatory reaction in the omentum cease and the formation of fibrin sets in. After nineteen days the epithelium was found to have completely covered the omentum, and about this time gland formation started. Four days later an increase of mucous membrane upon newly formed connective tissue and more pronounced fold formation in the epithelial edges are observed. The latter becomes still more pronounced after thirty-six days, mainly in consequence of the shrinkage of the connective tissue. As this shrinkage proceeds the original defect becomes smaller. After thirty-six days the epithelium has reached its normal height.

From the experiments made Enderlen and Justi conclude:

That wounds of the gall-bladder heal with complete replacement of the mucous membrane.

That abundant desquamation without free evacuation of the necrotic masses retards healing.

That regeneration of the muscularis is not very extensive.

The transplanted omentum is well adapted to replace defects of the gall-bladder.

In the transplanted omentum proliferation of connective tissue is first observed ; later, shrinkage sets in.

An epithelial covering is very soon formed on the transplanted omentum ; this, together with the newly formed mucous membrane beneath it, then rises in folds.

The original defect decreases in size in consequence of the shrinkage of the omentum and the contraction of the muscularis.

Practically the transplantation of the omentum rarely comes into question.

The opened gall-bladder of dogs when spread upon the liver forms a new cavity with the aid of the neighboring lobes of the liver.

Inflammatory Tumors of the Omentum have been seldom reported, but must be relatively more common than would appear from this fact, since Braun¹ saw five illustrations of the lesion in a few years. True tumors of the omentum are occasionally met with, such as lipomata, cysts, and cancers, and tuberculosis of the organ also occurs ; but the inflammatory tumors which Braun has reference to usually follow a laparotomy in which a portion of normal or inflamed omentum has been cut away and the remaining portion has been thoroughly ligated. This is not the invariable cause of the trouble, however, as there have been instances in which, after an operation for strangulated hernia, the omentum has become inflamed, although it was not involved in the strangulation, and, indeed, was not even seen by the operator. Such instances are the exception, however. Some writers have been inclined to ascribe the inflammation of the omentum to the ligation of its stump with silk, but it is also seen after the application of catgut ligatures. There can be no reasonable doubt that the inflammation of the omentum may have been derived from inflammation in some neighboring organ.

A striking feature in the development of an inflammatory tumor in the omentum is the length of time that may elapse after an operation before the symptoms manifest themselves. In one-half of the recorded cases this period was from one to four months, and several times the interval was much longer. This may be the reason why these tumors have been so seldom observed.

¹ Archiv f. klin. Chir., vol. lxiii. p. 378.

The situation of the tumor is usually on the same side of the body as the trouble for which operation was demanded, and higher or lower, according to the amount of omentum which was cut away. The tumor may or may not be adherent to the anterior abdominal wall. It is invariably tender to the touch, and usually gives a good deal of pain, even when not disturbed. Indeed, this is apt to be the first symptom noted. There is slight fever, which will, of course, be greatly increased if suppuration takes place.

The diagnosis is usually easy to make out if the above-mentioned facts are borne in mind. These tumors have been confounded with a displaced liver, with ovarian cysts, with tumors of the spleen, and with malignant tumors. The writer of this article recalls one case in his own hospital days as interne in which a portion of the omentum was excised on account of its presence in a left inguinal hernia. The stump inflamed and withdrew upward, and made a mass in the neighborhood of the splenic flexure of the colon. Malignant trouble of the large intestine was suspected, the abdomen was opened, and a section of tissue was removed for microscopical examination. The report was "probable spindle-celled sarcoma." A radical operation was undertaken, from which the patient died. The autopsy showed that an inflamed omental stump had attached itself to the splenic flexure, and the section for microscopical examination had been cut from the very abundant inflammatory tissue.

The treatment of these tumors should depend largely on the symptoms. If these are slight one may safely trust to diet and hydrotherapy to effect a cure. If an abscess develops it should be opened and drained. It has often contained silk ligatures. If no abscess is found it may be advisable to excise a large wedge-shaped piece of the tumor, in order to hasten its absorption. When the abdomen is opened, if the omental tumor is found to be freely movable, or only slightly adherent, it should be removed entire; but the rule laid down by Reynier, that every inflammatory tumor of the omentum should be removed, is not warranted by the facts, as many of these tumors entirely disappear in time. Braun is of the opinion that all tumors of the omentum cannot be avoided, but that the best measures toward this end are a perfect asepsis in operating, and, above all, the use of sterile ligatures and the inclusion in the ligatures of small bits of omentum at a time rather than large clumps of the organ.

LIVER.

Bile in the Peritoneal Cavity. In the present unsettled state of our knowledge of the results of injuries to the liver or biliary passages

any contribution to the pathology of these organs is most welcome. This is especially true of such carefully wrought-out experiments upon animals as Ehrhardt¹ has recently reported. When such experiments have established a few general principles it will be possible to learn more from the observations of clinical cases which up to the present time are, to say the least, confusing.

Ehrhardt first tried to ascertain whether large amounts of bile can be discharged into the abdominal cavity without danger. He divided the common duct near the duodenum, sutured the duodenal end so as to avoid infection, and allowed the bile to flow freely from the hepatic end. By this means he obtained a biliary fistula which discharged normal bile freely into the peritoneum as long as life lasted. The results were the same in the twelve animals operated upon. There was no appreciable shock. Jaundice appeared in twenty-four hours or more, and continued to death, which took place in from two to six days. Two of the animals showed subcutaneous hemorrhages; all suffered more or less pain. The tissues of the animal were found saturated with bile; but, although the divided duct was still patent, only a few cubic centimetres of bile were found in the peritoneal cavity. This fluid was absolutely sterile in every instance, and there were no signs of peritonitis. This tends to disprove the statement, which has sometimes been made, that bile can set up a chemical peritonitis. Death in these animals resulted from a real cholæmia, the ductus thoracicus being distended with bile to its termination in the subclavian vein. This death from cholæmia without peritonitis is in accord with the report of five cases of rupture of the common duct occurring in man. These five individuals died in from one to forty days, and at autopsy the abdominal cavity was found to contain a considerable quantity of bile and to be free from peritonitis.

In a second series of experiments Ehrhardt divided the hepatic duct instead of the common duct. The results in these experiments and in three reported cases of rupture of this duct in man were substantially the same as after division of the common duct.

It is a well-known fact that a great number of patients who have suffered an injury to the biliary passages recover after a jaundice which has lasted for several weeks or months. At first glance these results appear to prove that bile in the peritoneal cavity is harmless. Here, again, the experiments of Ehrhardt throw light on the processes. He introduced a mild infective agent—namely, a pure culture of the bacterium coli—into the abdomen of animals whose gall-bladders were at the same time snipped open and whose common ducts were incised.

¹ Arch. f. klin. Chir., vol. lxiv. p. 314.

Most of these animals died either of infection or of cholæmia; but two survived, and were killed at the end of two weeks, the jaundice being then slight. The peritoneal cavity contained from 300 to 400 cubic centimetres of slightly cloudy, bile-stained fluid, while all the intestinal coils, and especially the surface of the liver, were covered with a thin layer of fibrin, which had closed the slit in the common duct, while the adherent intestinal coils had blocked up the opening in the gall-bladder. It is well known that inflammation greatly hinders the absorption of fluid by the peritoneum, and in these cases the mild grade of inflammation set up by the bacterium coli had delayed a fatal cholæmia until the fibrin had had time to close the biliary fistulæ. In this sense a certain amount of peritonitis may save a patient who has had an injury to his biliary passages. But, that one ought not to trust to such an uncertain combination of circumstances, witness the fact that only two animals of several experimented upon were saved by this spontaneous cure. Operation should be performed as early as possible, before fatal absorption has taken place and before commencing adhesions make the location of the biliary fistula doubly hard. But even a late operation is better than the expectant treatment with frequent paracentesis to draw off the bile, since the open operation may enable the operator to locate the biliary discharge, and will almost certainly permit of drainage from the fistula to the surface; and a drain will not only free the system of the fatal dose of bile, but will materially aid in the closure of the fistula. If the rupture in the biliary passages is accessible the choice lies between suture, cystectomy, and cholecystenterostomy.

Traumatic Rupture of the Gall-bladder or Biliary Passages. Willard¹ operated upon a boy, aged five years, three months after the wheels of a heavy express wagon passed across his abdomen. At the time of operation there was intense pain in the abdomen and back, and marked abdominal distention with fluctuation, which involved the whole right side and lower portion of the abdomen. Only the left hypochondriac region was resonant. At the operation sixty-four ounces of bile were drained off, but on account of the enfeebled condition of the patient the situation of the rupture was not searched for. The patient's condition improved immediately, but the fluid reaccumulated so that thirty-two ounces were removed by aspiration two weeks later. Four weeks after that the line of incision protruded and was opened, and a few ounces of bile escaped. The sinus remained, and for some months discharged a small amount of bile daily. In six months the recovery was complete.

Several similar cases are on record showing the tolerance of the peritoneal cavity for sterile bile at periods varying from a few days to a few

¹ New York Medical Journal, March 1, 1902.

weeks. In such cases recovery is greatly facilitated by evacuation of the bile through an incision or through an aspirating needle. Many other patients who have suffered from rupture of the gall-bladder or of the biliary passages have died from the injury. Death usually occurs within a few hours or, at the longest, in a few days. If the patient lives some weeks he is likely to recover, provided the bile is able to escape from the abdomen. As an illustration, take the case of the boy reported by Skeete. The child was injured by a fall. Three weeks later sixteen pints of bile were withdrawn. Death ensued six weeks after the accident. At the autopsy two gallons of bile were found in a walled-off cavity. The indication is, therefore, to treat such a patient at first by absolute rest and then by laparotomy and drainage, or, if possible, suture. If the bile reaccumulates it should be repeatedly drained off, since there is a fair possibility that it will return more and more slowly until the patient's life is finally restored.

Courvoisier's Law. Cabot¹ calls attention to the wide-spread neglect of Courvoisier's law in reference to distention of the gall-bladder. Briefly stated, the law is this: *When the common duct is obstructed by a stone, dilatation of the gall-bladder is rare; when the common duct is obstructed by other causes, dilatation of the gall-bladder is common.* The truth of this law has been generally recognized in England and on the Continent, but many writers of American text-books have either neglected it or have made the statement that in obstruction of the common duct by a stone the gall-bladder is generally distended. In order to ascertain the correctness of the law Cabot made an examination of the records of the Massachusetts General Hospital, in Boston, and found that 30 autopsy reports and 56 operative reports were sufficiently accurate to serve as a test of the law. In 57 of these 86 cases the obstruction was due to stone; in 29 to other causes—almost always cancer of the head of the pancreas. In only 4 instances—2 of stone and 2 of cancer—did the amount of bile in the gall-bladder fail to correspond to Courvoisier's law; and in 1 of the 2 cancer cases there were calculi of the gall-bladder itself, which had led to a thickening of the organ. This is remarkable testimony to the accuracy of this law. Several reasons have been advanced to account for the different conditions of the gall-bladder in cases of obstruction due to cancer and to stone. Courvoisier thought that the previous existence of calculi in the gall-bladder itself has usually thickened that organ before the obstruction in the common duct occurs. Fenger believes that the stone is not always wedged closely into the duct, but may be loose or floating; and that its action may often be like that of a ball-valve, sufficient

¹ Medical News, 1901, vol. lxxix. p. 844.

to give rise to jaundice, but not sufficiently long-continued to cause distention of the gall-bladder. The value of this law is readily apparent. Excluding those cases of dilated gall-bladder due to stone in the cystic duct, and also those of acute cholecystitis, in which jaundice rarely occurs, there remains a large group of cases in which the most important signs are chronic jaundice, more or less intermittent, and the presence or absence of a dilated gall-bladder. If by means of this law one can say with a certainty of 95 per cent. that the obstruction is or is not due to a stone, the gain in both prognosis and treatment is tremendous. Obviously such cases as the one mentioned, in which cancer and stones coexist, may lead the observer into error, but they will constitute a very small fraction of the whole.

Technique of Operation upon the Biliary Passages. Mixer¹ gives some advice in regard to operations upon the gall-bladder and ducts which is worth repeating. He believes the surgeon should not wear gloves for these operations. The incision is through the outer part of the rectus, parallel to its fibres. The ducts are first examined by passing the forefinger of the left hand through the foramen of Winslow, the surgeon's back being toward the patient. Two threads passed through the wall of the gall-bladder to sustain it do less damage and take up less room than forceps. If the bladder contains much fluid a part of it should be removed by a hollow needle before it is incised.

Mixer believes in drainage in all cases of cholecystotomy. He uses a glass tube, with a flaring end, tied into the gall-bladder by a heavy silk thread. The bile flows into a bottle through a rubber tube attached to the glass drain. By this method he avoids stretching the gall-bladder up to the surface of the abdomen, and thus relieves his patient of considerable pain.

In performing cholecystectomy the bladder may be easily removed if the peritoneum is divided on either side at its reflection from the liver to the bladder. Sometimes the cystic duct and artery may be tied separately, but usually they are so close together that one ligature secures them both.

After a stone has been removed from the common duct it is unnecessary to close the incision. Finely divided gelatin, sterilized and perhaps mixed with a little adrenalin, may be used on cut and torn surfaces to prevent continued hemorrhage in jaundiced patients.

Incision of the Liver to Relieve Distention. Davis² calls attention to a certain class of cases of biliary calculus with obstruction in which the surgeon finds it impossible to locate the passages in the time which

¹ *Annals of Surgery*, January, 1902.

² *Journal of the American Medical Association*, 1901, vol. xxxvii. p. 1573.

may be safely allotted to the operation. Under such circumstances he thinks it may sometimes be of advantage to incise the liver in order to relieve this distended organ and to reduce the degree of cholemia. After a few days the surgeon may be able to locate the obstructing stone and remove it with less risk to the patient than would have been the case if he had attempted to carry out the whole operative procedure at the time of the first operation. Davis admits that the instances in which this manœuvre is indicated will of necessity be few in number, and will be less and less likely to arise as earlier choledochotomy is the rule. One of the two patients upon whom he thus operated was distinctly improved by the hepatic incisions. The biliary obstruction in the other was due to malignant disease, and the patient died in five days. Experiments carried out upon dogs also tended to prove that such incisions will relieve some of the severe symptoms due to the absorbed bile in complete biliary obstruction.

Mortality of Operation for Obstructive Jaundice. Deaver¹ says the common causes of death after operation for obstructive jaundice are hemorrhage, exhaustion, and shock. Primary hemorrhage ought not to occur. Consecutive hemorrhage is due to the blood changes dependent upon prolonged jaundice. It seems probable that there is some chemical change which inhibits the fibrin-forming element, and thus prevents rapid coagulation. Furthermore, the effect of the bile upon the blood-vessels may be to produce a relaxed condition and interfere with proper contraction. Consecutive hemorrhage can usually be limited by properly applied gauze packing; secondary hemorrhage sometimes occurs, and may cost the life of the patient. It is therefore of great importance not to increase the risk of hemorrhage by delaying operation until the patient has been saturated with bile for a long period. The next most common cause of death is exhaustion. It is difficult to separate congestion from cholæmia; indeed, it seems likely that most of the deaths ascribed to exhaustion or heart failure are really due to a cholæmia present. This is then another reason for deciding upon early operation. Shock cannot be separated from hemorrhage as a cause of death, as it is really due to the loss of blood either at the time of the operation or afterward. Here, again, cholæmia acts as an adverse circumstance, and the argument for early operation becomes still stronger.

Abscess of the Liver. Cantlie² has treated deep-seated liver abscesses with a trocar and canula and siphon drainage twenty-eight times, with four deaths. He claims that the pus should be sought for early, before

¹ *Annals of Surgery*, July, 1901.

² *British Medical Journal*, 1901, vol. ii. p. 677.

it has caused the surface of the liver to inflame and attach itself to the abdominal wall or diaphragm, and long before fluctuation or a parietal bulging can be made out. It is perfectly safe, in his judgment, to introduce a hollow needle one or a half-dozen times into the liver in the search for pus, provided the needle is sterile each time it is introduced and provided the operator is ready to proceed against the abscess as soon as it is located. To expose the surface of the liver before aspirating is of no use, since the location of the abscess will not be indicated thereby, and the danger of aspiration and of subsequent drainage are increased. As soon as the pus is located the skin should be incised for about three-quarters of an inch to admit the trocar and canula, which are plunged in the most dependent portion of the abscess cavity, either between the ribs, or through the abdominal wall, as the case may be. The trocar is removed and the flow of pus prevented until a rubber drainage-tube, about nine inches long and which is tightly stretched on a metal rod, can be introduced. The canula is slipped off over both and the tube relaxed so that the rod can be withdrawn. By means of a short glass tube connection is established with a rubber tube long enough to reach a vessel of carbolic acid placed by the bedside. This rubber tube may be filled with boric-acid solution to start the siphonage, if necessary. If the drainage-tube is held in place by stitching it to the skin the stitch should not penetrate the lumen of the tube. No attempt should be made to wash out the drainage-tube unless the flow becomes obstructed and the patient's temperature rises. Under ordinary circumstances the flow of pus will diminish in a few days and finally become bile-stained, when the drainage-tube may be cut off close to the surface of the body and then exchanged for a smaller and shorter one a day or so later. This method of operating is so much simpler and less dangerous than the plan of excising a part of a rib, traversing the pleural and peritoneal cavities, and cutting through the substance of the liver in order to permit the escape of pus, that Cantlie says it should be preferred in all cases; and his contention is emphasized by the fact that these abscesses usually occur in hot countries under circumstances which are not favorable to difficult operating. The writer also calls attention to the fact that echinococcus cysts and abscesses of the liver must not be confounded; that while echinococcus cysts may suppurate, their treatment even then is quite different from the treatment of a liver abscess pure and simple. An operation, therefore, which has been found necessary in the case of cysts is not necessarily indicated in the case of an abscess.

Robinson¹ holds other views in regard to the treatment of these abscesses. He advocates the excision of a part of the eighth or ninth

¹ Journal of the American Medical Association, 1901, vol. xxxvi. p. 1319.

rib in the mid-axillary line and the postponement of incision of the abscess for forty-eight hours unless the liver is already adherent; then the abscess should be drained, but not irrigated, for forty-eight hours more. He reports five cases, four of the patients having died. This high mortality is explained by the fact that the abscesses are often multiple and that the patients are not seen sufficiently early. It may not be fair to compare the results in five cases with those in twenty-eight treated by Cantlie with a trocar and canula, with four deaths; but the difference in the mortality between 80 per cent. in one instance and 14 per cent. in the other makes it natural to do so. Whether or not it is true, as Cantlie says, that an open operation will be apt to be longer delayed than a puncture, on account of the greater dread excited by it in the mind of the patient and his medical adviser, the additional delay of forty-eight hours before the abscess is opened when the open method is followed must certainly make a very great difference in the case of these debilitated individuals.

Eliot¹ scorns the treatment of a liver abscess by trocar and canula, the objections to which, he says, are too evident to require mention. He classifies operative procedures as follows: (1) Transpleural, anterior, posterior; (2) subpleural, anterior; (3) transperitoneal, anterior, posterior.

That operation should be chosen which will open the abscess cavity at a point nearest the surface of the liver and which will afford the best drainage. In many cases the location of the abscess cannot be determined; the anterior transperitoneal method is then the best.

In the posterior subpleural operation an oblique incision is made over the ninth rib behind. A portion of the rib is resected and the pleural sac is pushed upward without opening it—an impossibility if the pleura is involved in the inflammation—and the abscess is drained through the diaphragm. In the anterior operation the seventh or eighth right costal cartilage is resected. If the pleural cavity is opened it may be protected from contamination by a suture or by a gauze packing. In the latter case the abscess cavity is not opened until adhesions have had time to form.

In the three cases reports of which are given by Eliot the anterior transperitoneal method was chosen, and the operation was performed as follows: A three-inch incision was made parallel to the outer border of the right rectus muscle, and the location of the abscess cavity was determined by a large exploring needle. After the pus was detected the needle was left in place, being fastened to the skin by a loop of silk and rubber plaster. Iodoform gauze was packed around the point

¹ *Annals of Surgery*, 1901.

of entrance of the needle into the liver. After five or six days the gauze and needle were removed, and the abscess cavity was opened by the cautery.

This method of operating not only allows the evacuation of part of the contents of the abscess at the time of operation or at any time afterward, should the symptoms of the patient make this desirable, but the needle serves as a guide for the insertion of the point of the cautery. When the abscess has been opened it is to be drained by a single large rubber tube, slight suction being kept up by the application of the Sprengel air-pump principle.

Two of the patients operated upon recovered, while the autopsy upon the third proved that he had been suffering from numerous abscesses, the largest of which had been opened at the time of operation.

The right lobe of the liver can be easily reached transperitoneally through the lumbar incision used to expose the kidney.

Echinococcus Cysts of the Liver. Stevens,¹ in discussing the various reasons which have been given to explain the spontaneous death of hydatid cysts, shows that most of them are based on untenable theories. Cysts have been known to live for forty years, and have been found dead at all stages of existence, so that the term "natural death" of the parasite is unwarranted. Others have said that the "bile has a toxic action," pointing for proof to the fact that dead cysts often contain bile. However, other dead cysts do not, and dead cysts are found not only in the liver, but in the lung and elsewhere. There is no good evidence that "absorption of the fluid of the cyst" produces its death. The corrugations of the inner lining which have been cited may either be due to a continued growth in the presence of a fixed outer capsule or they may have occurred after the death of the cyst. Tapping cysts as a curative measure was based upon this false idea, and has been found not only a useless procedure, but a dangerous one, on account of possible hemorrhage or infection; nor is there any evidence to support the view that the mere "development of daughter cysts can kill the whole by too great pressure." Parasites stand a great deal of pressure, and dead cysts have been found in all stages of development. The death of a cyst is really due, according to Stevens, to changes in the fibrous capsule—the so-called ectocyst, a membrane derived from the host, the bloodvessels of which supply the needful nourishment to the parasite. If this capsule undergoes condensation or becomes so fibrous that the blood-supply is diminished beyond a certain point the cyst must die. In this way cirrhosis of the liver may affect a cure of hydatids of the liver. Stevens supports this view by numerous observations drawn

¹ British Medical Journal, 1901, vol. i. p. 1140.

from his own post-mortem work as well as that of others. While this view offers no suggestions for medical or surgical treatment, it shows clearly how worse than useless are attempts at cure by means of injection, aspiration, and so forth. The proper treatment is the removal of the entire cyst contents.

Tumors of the Liver. Langer¹ says that experience has shown that tumors of the liver may be removed with comparatively little danger. The liver bears operative attack very well. In 1887 Langenbuch resected with complete success a pedunculated lobe weighing 370 grammes (12 ounces). Two years later Ponfink showed by his experiments upon animals that the liver possesses a great power of healing and regeneration. Von Podwyssozki proved that after wounds of the liver there is a regenerative growth not only near the wound, but at a considerable distance from it, in which the liver cells and the epithelial cells of the biliary passages take an active part.

The most important point in hepatic operations is the control of hemorrhage. This is best accomplished by direct pressure or by a thermocautery at a low glowing heat. Wounds of the liver should be treated extraperitoneally. They should be ligated and stitched with catgut only—not with silk, since the silk stitches are cast off very slowly, and may greatly delay recovery. On account of the rapid absorption by the liver, antiseptics should not be applied to its freshly wounded surface.

Cirrhosis of the Liver. Additional proof has been produced during the past year that the establishment of a collateral circulation will greatly benefit the patient suffering from cirrhosis of the liver with ascites. Such relief may occur accidentally, as in a case mentioned by Herrick.² A man who had been tapped many times for ascites, which as often recurred, was one day operated upon for strangulated umbilical hernia. His ascites never recurred, though he lived a year afterward, dying of pulmonary tuberculosis.

Mitchell and Bloodgood³ have operated upon six patients in the hope of producing anastomosis between the omentum and anterior abdominal wall. One patient was cured of his ascites, three were not improved, one died from the operation, and the sixth was doing well at the time of report, three weeks after operation. In this last case it was observed at operation that adhesions had already been established by nature, not only between the omentum and anterior abdominal wall, but between the transverse colon and anterior abdominal wall; and these adhesions contained large bloodvessels.

¹ Archiv f. klin. Chir., vol. xlvi. p. 630.

² Journal of the American Medical Association, 1901, vol. xxxvii. p. 885.

³ Ibid., October 5, 1901, vol. xxxvii. p. 887.

At a meeting of the New York Academy of Medicine, held November 21, 1901, there was a discussion of the operative treatment of ascites following cirrhosis of the liver.

Tilden Brown reported a successful case, the patient being a man from whom 180 pounds of fluid had been removed by tapping in a period of a few weeks. The peritoneal surfaces of the liver and abdominal wall were scrubbed with sponges and sutured, and a gauze drain was kept in for more than a month. Brown's conclusions were: (1) The more rapid the accumulations of ascitic fluid the more need of prolonged drainage; (2) in advanced and apparently hopeless cases there is the greater necessity for thorough aseptic pelvic drainage; (3) the advantage of Morrison's adhesive strapping was conclusively shown during the after-treatment of this case.

Peck also reported a successful operation for the relief of ascites.

Brewer¹ read an exhaustive paper on the subject, based upon fifty-seven reported cases, not including those mentioned above. He says that until operators learn to report a little more fully the exact conditions precedent to such an operation a large part of the value of their statistics will be lost. He suggests that in reporting cases of this character the surgeon should mention the following points: Age and sex of the patient; history of syphilis, or tuberculosis, or alcoholism; previous peritoneal inflammation; duration of ascites; number of tappings; condition of heart, lungs, and kidneys; exact condition of abdominal viscera observed at operation; anæsthetic used; method and duration of operation; method of drainage; subsequent treatment; immediate and remote results. When full reports have been obtained of say fifty cases one can safely draw some conclusions as to the possibly curative effect of this new method of treating an otherwise incurable and, according to some writers, speedily fatal condition. Even though the operation is still in an experimental stage, it is manifestly unfair to say, as Campbell Thompson has done, that in no case has ascites due to uncomplicated cirrhosis been cured by operation, but that the successes have been in those cases only in which the ascites was due to some complicating lesion, such as perihepatitis or chronic peritonitis. Brewer has been able to collect 60 published and unpublished cases, in many of which, unfortunately, the very data he deems essential are lacking; hence the percentage of results will probably be much changed by later and more reliable data. They are given, however, for what they may be worth. Death followed 22 times in 59 operations, a mortality of 37.3 per cent. The remote result is given in 56 cases. There was a cure effected 11 times, or in 19.6 per cent.; an improvement 8 times,

¹ Medical News, February 8, 1902.

or in 14.3 per cent.; no improvement 15 times, or in 26.8 per cent., with death in the remaining cases. Six of the patients whose histories are included in the collection are known to have been cured for a period of more than two years after operation, while 6 others were relieved for from two to six months, with no recurrence of the ascites at the time of report.

Brewer gives the details of five operations of this character performed by himself upon patients with undoubted ascites due to alcoholic cirrhosis and without complicating peritonitis. In each case the liver was small and the spleen was large. All the patients were in the last stages of toxæmia from the disease. All but one had marked evidences of nephritis. Four of these patients died from the operation. The fifth was somewhat benefited, but, unfortunately, disappeared from view in two months. The cause of death is given by the operator as follows: In one case, from uræmia due to the use of ether in a patient with marked nephritis; in a second, from shock on account of prolonged operation; in a third and fourth, from infection due probably to faulty drainage. If more operators were as courageous in reporting all their results, good as well as bad, the surgical world, or at least that part of it that reads, would soon have a fairly accurate opinion of the value and risk of the various new operations proposed.

In this connection a paper by Stockton,¹ "On the Circulatory Disturbances Accompanying Hepatic Cirrhosis," is worth reading. He finds that the blood-pressure in the portal circulation is always lower in health than the pressure in the systemic circulation, so that, although anastomosis exists, no portal blood reaches the general circulation except through the liver. In hepatic cirrhosis the pressure in the portal system is much increased, so that blood may pass directly from the portal to the general venous system through either natural or acquired anastomoses. If this overflow is great, alarming symptoms of toxæmia and even death may follow. If the overflow is slight and its increase gradual the patient may grow accustomed to it, and only suffer in case of increased proteids in the diet. Stockton cited several cases in which patients who could live comfortably on milk and carbohydrates were made ill by any food in excess as well as by small quantities of shell-fish, game, cheese, or other proteids. The autopsies made in these cases showed a greatly increased anastomosis between portal and systemic circulation. Such patients do not develop ascites. The practical point for the surgeon is that if toxæmic symptoms arise after artificial anastomosis they can be met and relieved by a light diet and free purgation to lower the blood-pressure in the portal system.

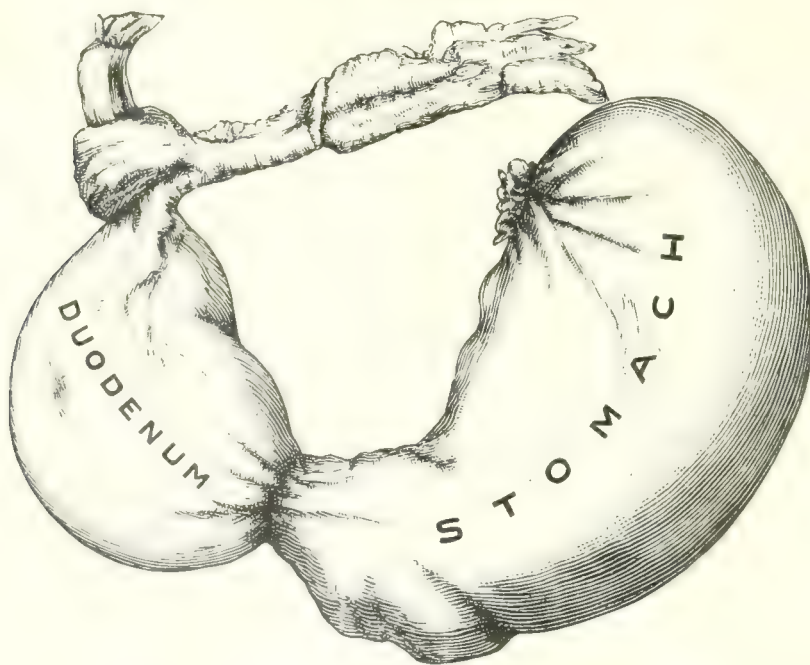
¹ Journal of the American Medical Association, 1901, xxxvii. p. 817.

Prolapse of the Liver. Jonas¹ proposes to use the gall-bladder as a suspensory ligament in cases of prolapsed liver, having already carried out this procedure successfully. In the case of a woman, aged forty-one years, whose liver was easily replaced at operation, the gall-bladder contained several calculi, which were removed after the bladder had been fixed to the abdominal wall in the usual manner. A drainage-tube was employed in the gall-bladder for one week, and the wound was completely closed in four weeks. Several subsequent examinations were made in order to ascertain the situation of the liver, and it was always found in its normal position, while the patient was cured of the dragging pains, which had lasted for three years.

PANCREAS.

Abnormalities of the Pancreas. Ticken² enumerates these abnormalities of the pancreas: Variation in the ducts; an accessory gland; pancreas minus—a condition in which a small lobule springs from the

FIG. 8.



Annular pancreas with sacculation of duodenum.

head of the gland and extends along the duodenum; a partial division of the gland as a result of pressure by the mesenteric vessels during development; hypertrophy of the head of the pancreas, so that it partially surrounds the intestine; and hypertrophy to such an extent that the pancreas completely surrounds the intestine, or pancreas annulare.

¹ *Journal of the American Medical Association*, 1902, vol. xxxviii. p. 122.

² *American Medicine*, November 22, 1901.

This last is the most important abnormality, and may lead to sacculatation of the duodenum above it and to hypertrophy of the pylorus and of the wall of the stomach. Although this abnormality is a rare one, it should be borne in mind by the surgeon in operating for obstruction. The condition pictured in the accompanying illustration (Fig. 8) might easily lead to the conclusion that an hour-glass stomach was present.

Diagnosis of Pancreatic Disease. At the annual meeting of the Medical Society of the State of New York, held January 28 to 30, 1902, the pancreas came up for its share of discussion. Thayer spoke of the diagnosis of pancreatic disease. He said that the organ was so deep and so covered by stomach and bowels that it is practically out of reach of palpation, except in very thin people in whom there is separation of the recti muscles. If pancreatic disease is accompanied by suppuration the pus very soon passes into the omentum around the pancreas, causing abscess of the omental bursa. This gives rise to a distinct tumor deep in the abdomen and not influenced by respiration. If the sacrum and large intestine be distended with gas, this tumor will, of course, be situated behind them. A large cyst can be recognized by palpation. Cysts due to traumatism may be very large indeed, even filling the greater part of the abdomen. Retention cysts are usually small, and therefore cannot be palpated. Secondary carcinomata are not readily recognizable. If a small tumor is very hard it may be possible to feel it through the abdominal walls.

Examination of the stools does not give the help in diagnosis that one might suppose it would. Considerable change may take place in the pancreas without any apparent change in the stools, since there are a number of other digestive functions that compensate for lack of pancreatic action. If, however, there is more fat, or more soap than usual, or less of the fatty acids, it may be inferred that the fat-splitting ferment of the pancreas is absent from the digestive tract. The presence of too many undigested muscle fibres is also a suspicious sign, since the trypsin of the pancreas is one of the most important meat-digesting ferments.

IN ACUTE HEMORRHAGIC PANCREATITIS the conditions that come up for differential diagnosis are biliary colic, intestinal obstruction, and intestinal perforation. The pain in acute pancreatitis is similar to that of biliary colic, but is even more intense. It is situated in the median line in the pancreatic region, with a tendency to extend toward the left, whereas the pain of biliary colic is usually situated to the right of the median line and tends to extend upward. In intestinal obstruction there is stercoraceous vomiting. Moreover, the pain is usually lower down in the abdomen. Peristaltic lesions or inflated

coils of intestine can often be seen through the abdominal wall. In perforation of the intestine, collapse is greater than in acute pancreatitis, and the condition more rapidly reaches its acme. Mesenteric infarction gives a set of symptoms similar to those of acute pancreatitis, except that they are usually not so violent.

Surgical Treatment of Disease of the Pancreas. Park,¹ in discussing the surgical aspect of the subject, said that it is possible to reach the pancreas and remove portions of the gland or open cysts without exposing the patient to great risk. It has been his experience that the pancreas may, in spite of its normally firm supports, become loose and prolapsed, so that it may be readily palpated. Disorders of digestion may follow, due to interference with the pancreatic function; to mechanical interference with other organs, and to the influence of reflexes upon the digestive functions. The splenic end of the pancreas may be excised, and, even though it is necessary to tie both the splenic artery and vein, necrosis does not usually result. If a cyst of the pancreas be opened and its edges stitched in the abdominal wound, eventual recovery without a sinus is to be looked for, although the wound may not entirely close for a long time. If an abscess is present it may be readily drained from behind. Even the subphrenic space can be drained through an incision between the tenth and eleventh ribs in the axillary line. For example, this was accomplished by Mayo upon a patient supposed to be suffering from gangrenous cholecystitis. Park urges an early operation. When the symptoms are at all serious, delay is almost sure to be regretted. His own rule is "when in doubt operate early."

Symptoms of Cyst of the Pancreas. Seefisch² found six cardinal symptoms of pancreatic cysts present in four cases which came under his observation. These symptoms are: 1. More or less discomfort, attributable to the stomach, varying from a sense of slight pressure to the most severe pain, with repeated attacks of vomiting. 2. Emaciation. 3. The development of a tumor in the epigastrium more to the left than to the right. 4. On account of the close approximation of the cyst to the posterior abdominal wall there will be a transmitted aortic pulsation. 5. Little mobility of the tumor either on pressure or by respiration. 6. When the stomach and transverse colon are blown up they will be seen to lie in front of the tumor.

Three of the patients whose histories are given by Seefisch were treated by laparotomy, suture of the cyst into the abdominal wound, and immediate drainage. They all recovered and had no recurrence of

¹ Medical News, February 8, 1902.

² Deutsch. Zeitschrift f. Chir., 1901, vol. lix. p. 153.

their trouble. The fourth patient, after a very hard horseback ride, felt something give way in his abdomen, and was obliged to go to bed. For some hours there was a profuse diarrhœa. The next day he felt well, and the tumor had disappeared. Such a spontaneous discharge of the contents of a retention cyst of the pancreas through the natural duct into the intestinal canal is very rare. This patient also had no recurrence of his trouble.

Removal of the Pancreas. Those who take a special interest in the possibility of removal of whole organs will be pleased to learn that the pancreas has been removed entire and that the patient not only recovered from the operation, but lived nearly six months after the operation, during which time there was neither glycosuria, nor albuminuria, nor any evidences that the system suffered materially from the lack of a pancreas. The patient died finally from an extension of a carcinoma to the whole region around the seat of the pancreas. The history in brief was as follows: A woman began to suffer with gastric symptoms at the age of sixty-five years. Two years later there was a tumor in the pyloric region, which was found to be a benign stricture of the pylorus. Franke,¹ of Braunschweig, performed successfully pylorotomy by Kocher's method. No enlarged glands were found, and while the pancreas was not especially examined, nothing abnormal was noted in connection with it or with any other organ. The patient did well for a year, and then began to have some loss of weight and of appetite, and noticed a slowly growing mass in the region of the operation. Examination eighteen months after the pylorotomy showed a rather tender, slightly movable tumor in the pyloric region. Operation was at once undertaken, and the carcinomatous pancreas was removed entire. The separation of this organ was described as a difficult one, and was carried out sometimes as a blunt dissection, sometimes with a knife, and sometimes with the cautery. The splenic vein was twice cut into, but was successfully sutured. The stomach and intestine appeared free from the disease. The patient made a good recovery, although complaining for two days of a great deal of abdominal pain and vomiting more or less. The carcinoma continued to grow in the vicinity of the pancreas, and death resulted in five and one-half months, from exhaustion due to this cause.

Franke operated upon three other patients having carcinoma of the pancreas, but the disease was so far advanced that in no case was it possible to remove the whole of the growth, and the patients died in fourteen, seventeen, and eighteen days after operation.

¹ Centralblatt f. Chirurgie, April, 1901, p. 95.

SPLEEN.

Splenectomy and Splenic Anæmia. Harris¹ reports two removals of the spleen for splenic anæmia, and reviews the medical and surgical literature in connection with this disease and its treatment. Splenic anæmia is marked by a considerable enlargement of the spleen, by an anæmia in moderate degree accompanied by a reduction in the percentage of hæmoglobin; by an absence of the blood changes peculiar to leukaemia; by a loss of strength and weight, and by a steady progression to a fatal termination. It has been stated that a patient suffering from this trouble cannot live more than three or four years, but instances have recently been reported where life was prolonged for nine years or more. The changes which take place in the blood consist in a diminution in the number of erythrocytes, with a reduction in the percentage of hæmoglobin. There may be a leucocytosis, though this is usually not marked. The differential count shows no characteristic changes.

After the removal of the spleen there is a marked increase in the percentage of eosinophiles, especially after some months have passed. Large mononuclears are also increased, but the total number of white cells remain about normal. The red cells return to the normal within a shorter or longer time after the removal of the spleen. Examination of the spleen in this disease shows that the pulp spaces are much enlarged and lined by large endothelial cells. They often contain in addition masses of endothelia; hence, the process was formerly regarded by some as a diffuse endothelia. But this opinion is not now generally entertained. Harris believes the condition to be similar to that found in lymphangioma, in which there is proliferation of lymphatic endothelium, with enlargement and new formation of lymph spaces. Larger or smaller ischaemic infarcts are also found in the spleen in splenic anæmia.

Can the pathological changes in the spleen explain the progressive deterioration of the blood? If the red blood-corpuscles are normally destroyed in the spleen by the endothelial cells, will the increase in the endothelial cells explain the decrease in the red corpuscles of the blood? There is no evidence as yet to support such a theory. Possibly the red blood-corpuscles are destroyed by an enzyme secreted by the endothelial cells. With the increase of these cells in the spleen it may be that the enzyme is secreted to an abnormal amount, and hence the greater destruction of red blood cells. If either theory is correct

¹ *Annals of Surgery*, July, 1901.

it is evident that the removal of the spleen must stop the excessive destruction of the red blood cells, for the lymph nodes of the body, although possessing a certain erythrolytic function would not completely substitute for the spleen. Theories aside, the fact remains that the medical treatment of splenic anemia has thus far been unsuccessful, while splenectomy has cured a considerable number of patients. There are recorded in literature some nineteen cases, with fourteen recoveries and four deaths. In one case the outcome of the operation was not given. Some of the patients are known to have regained their full health.

The technique of the operation is not difficult: a median incision is made and the gastrosplenic omentum is divided between ligatures. The spleen can then be brought out through the wound and its pedicle ligated. If the size of the spleen makes this plan of procedure impracticable, the lower end of the organ should be drawn upward and its pedicle ligated, care being taken not to puncture or tear the enormously dilated veins. When the pedicle has been divided the spleen can be brought out of the wound and the gastrosplenic omentum be attended to.

Harris and Herzog, of Chicago,¹ report two cases of splenectomy successfully performed for enlargement of the spleen. They mention also seventeen cases operated upon by various surgeons. Adding these to their own gives a series of nineteen splenectomies for primitive splenomegaly, with fourteen recoveries and four deaths; in one case no data are given. This gives a mortality of a little over 20 per cent., which may be considered a very favorable result.

With regard to late results, Harris and Herzog state it is to be regretted that in the majority of cases no data are given. In eight instances the report merely states that the patients recovered and are well, without indicating how long after operation this observation was made. In one case the patient is reported well one year, in another twenty-one months, and in a third thirty-three months after operation.

If it could be determined, after careful observation, as Harris and Herzog remark, that patients not only recover from the operation but remain well permanently, splenectomy would become the specific treatment for the disease under consideration; and inasmuch as the difficulties and dangers of the operation increase in direct proportion to the size of the spleen, it would seem advisable to operate just as soon as the diagnosis has been definitely made and the uselessness of internal medication has become apparent.

¹ Deutsch. Zeitschrift f. Chir., May 1901.

KIDNEY.

Functional Activity of the Kidneys. Casper insists on the value of the separate examination of the urine from each kidney in order to determine the functional activity of each organ. This is the vital point rather than its pathological or anatomical condition, as shown by casts, blood, etc., in the urine. The functional activity is shown by three things: the freezing-point (Δ), the quantity of nitrogenous products (N), and the quantity of sugar (Sa, for *saccharum*) found in the urine after a subcutaneous injection of phloridzin. The significance of the amount of N is well understood. The freezing-point Δ measures the molecular concentration of a liquid. The greater the number of molecules which are dissolved in a liquid the lower will be Δ as compared with that of distilled water. The greater the number of molecules which the kidney has worked out of the blood which streams through it the greater its activity—in other words, the lower will be Δ of the urine. The normal Δ of urine lies between one and two degrees Celsius below that of water. Phloridzin is a material which, when injected subcutaneously, causes sugar to appear in the urine. This result is due to the active chemical effort of the parenchyma of the kidney; it is not a simple filtration of sugar present in the blood current, for there is no hyperglycæmia, and, indeed, there may be a decrease in the amount of sugar in the blood. Exactly how the sugar is produced in the kidney is not known, but its presence in the urine under such circumstances is a measure of the functional activity of the organ. Casper mentions ten cases to show how the functional activity of the kidneys was ascertained in the manner indicated. The importance of having this exact information before performing any radical operation upon a kidney is readily understood.

Take as an illustration the following history: A man whose right kidney had been cut into on account of pyuria, still had a fistula nine months later. It was the intention to remove this kidney if the condition of the other warranted the operation. The examination of the urine from the separate kidneys showed pus and albumin in large amount from the right kidney and in small amount from the left kidney. Here was insufficient data on which to proceed. By the tests above mentioned the following results were obtained: Urine from the right kidney, N, 0.052; Δ , 0.05; Sa, 0; urine from the left kidney, N, 0.189; Δ , 0.9; Sa, 0.55. The right kidney was evidently doing almost no work, while the left one, though affected with pyelitis, was functionally active. The nephrectomy was carried out. There was very little parenchyma in the right kidney. The patient did well after

its removal, though his urine still contained a small amount of pus. The full report of these cases will be found in the *Archiv für klinische Chirurgie*, vol. lxiv. p. 470.

Freezing-points of Blood and Urine. Kummell¹ calls attention to certain reliable indications in difficult diagnosis of surgical diseases of the kidney, and more especially to the freezing-points of the blood and urine. The normal freezing-point of blood is from 0.55° to 0.57° C. below that of distilled water. If the blood of a patient with kidney trouble freezes at this temperature one is sure that his kidneys are performing their work satisfactorily; if, on the other hand, the blood freezes at 0.59° or 0.60° C. below that of distilled water, one may be almost equally sure that the kidneys are not doing sufficient work. Under such circumstances to remove one of them would be to invite almost certain death. A special apparatus is required to make this test, and about 20 grammes (two-thirds of an ounce) of blood are needed, usually drawn from a vein through a hollow needle.

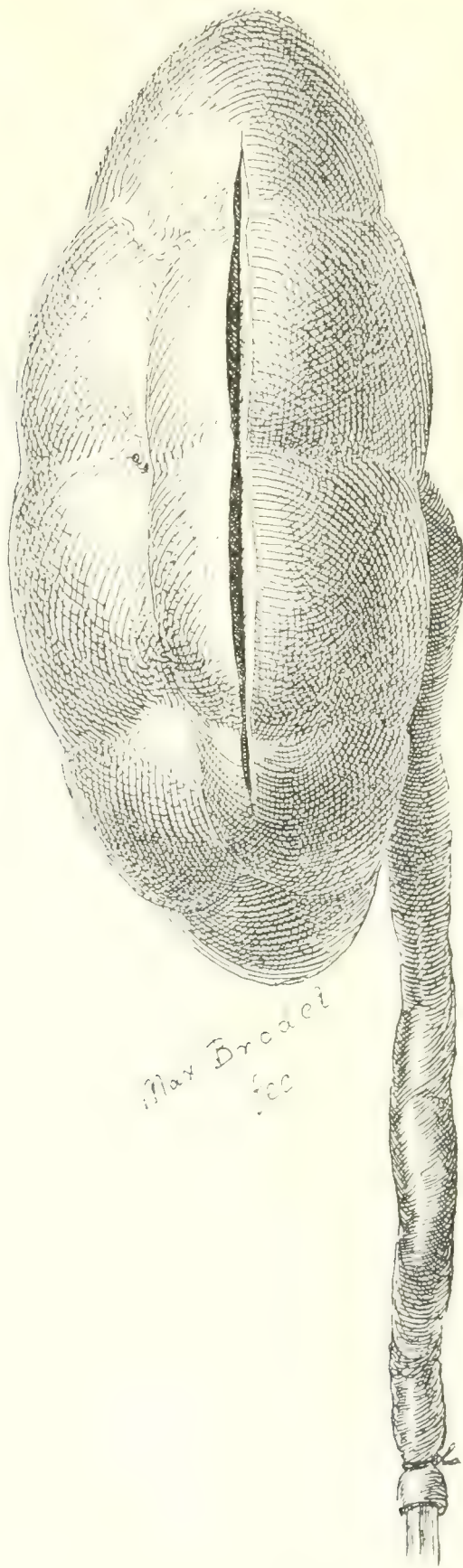
Additional information can be obtained by the determination of the freezing-point of the urine obtained by the ureteral catheter from each kidney. The freezing-point of urine is not so constant as that of blood, ranging from 0.90° to 2° C. below that of distilled water. If less than 0.9° C. below the freezing-point of water, renal insufficiency is indicated. If, in addition to these signs, the amount of urea is estimated, and the function of the kidney is tested by the phloridzin method, the operator can tell definitely whether the patient ought to stand the loss of one kidney or not. The risk of cystoscopic examination and ureteral catheterization, if properly carried out, is very small indeed. Without these exact data upon which to form his judgment the operator acts blindly and may occasionally have surprising results, as numerous cases quoted by Kummell tend to prove.

Use of the Ureteral Catheter in Kidney Operations. Kelly² makes use of the ureteral catheter in order to wash out the pelvis of the kidney before operation and also to distend the pelvis after the kidney has been exposed. This causes the kidney to swell up and make prominent certain landmarks which serve as a guide for a correct incision. If the kidney is grasped with the hand, and is made alternately to swell and to collapse, the exact position of the calyces can be detected. The part where the cortex is thinner becomes evident, and the incision is best made there. In the distended kidney the vascular septa between the lobules are easily made out. (Fig. 9.) The incision should be made between these while the kidney is distended. The injury to the cortex

¹ Arch. f. klin. Chir., vol. lxiv. p. 579.

² British Medical Journal, 1902, vol. i. p. 256.

FIG. 9.

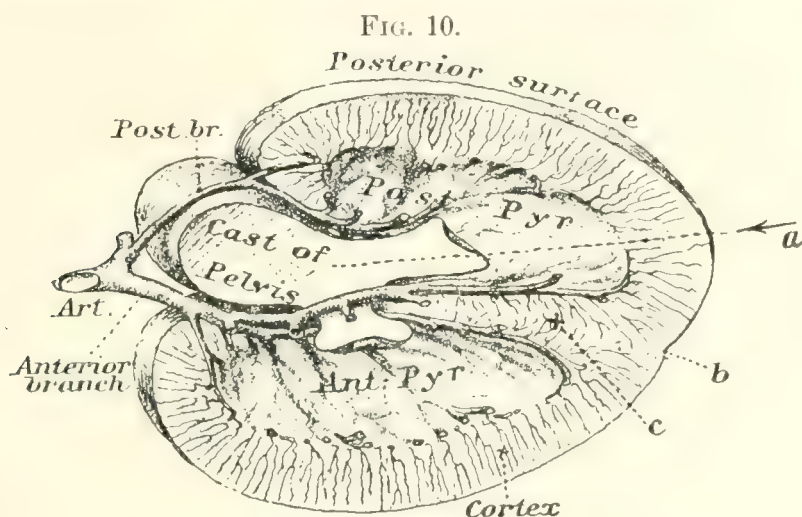


Max Broedel
fec

Kidney with its pelvis in a state of distention.

is then less, and the water gushing from the pelvis will sometimes bring out a small stone. Broedel has shown that most kidneys have two arterial systems. The major system carries three-fourths of the arterial blood and supplies the anterior and a part of the posterior half of the kidney. The minor arterial system supplies the remainder of the posterior half. (Fig. 10.) The nearer the line of incision is to the line which divides these systems the less the loss of blood, and the greater the distention of the pelvis the further will these systems be separated.

The surface of the kidney often shows whitish lines, which represent the columns of Bertini. These extend between the pyramids and form the framework which carries the vessels. These white lines together often form a longitudinal white line on the surface, which Kelly calls



The renal artery and the distribution of its branches in relation to the pelvis.

The dotted line and arrow *a* indicate the plane of arterial division; *b* shows a depression on the surface of the kidney which marks the border-line between the cortical portions of the anterior and posterior row of pyramids; *c* is a section of the longitudinal column of cortical substance in which the great majority of the renal vessels pass. The figure is drawn from a corrosion specimen. The vessels of the cortex have been omitted for the sake of clearness.

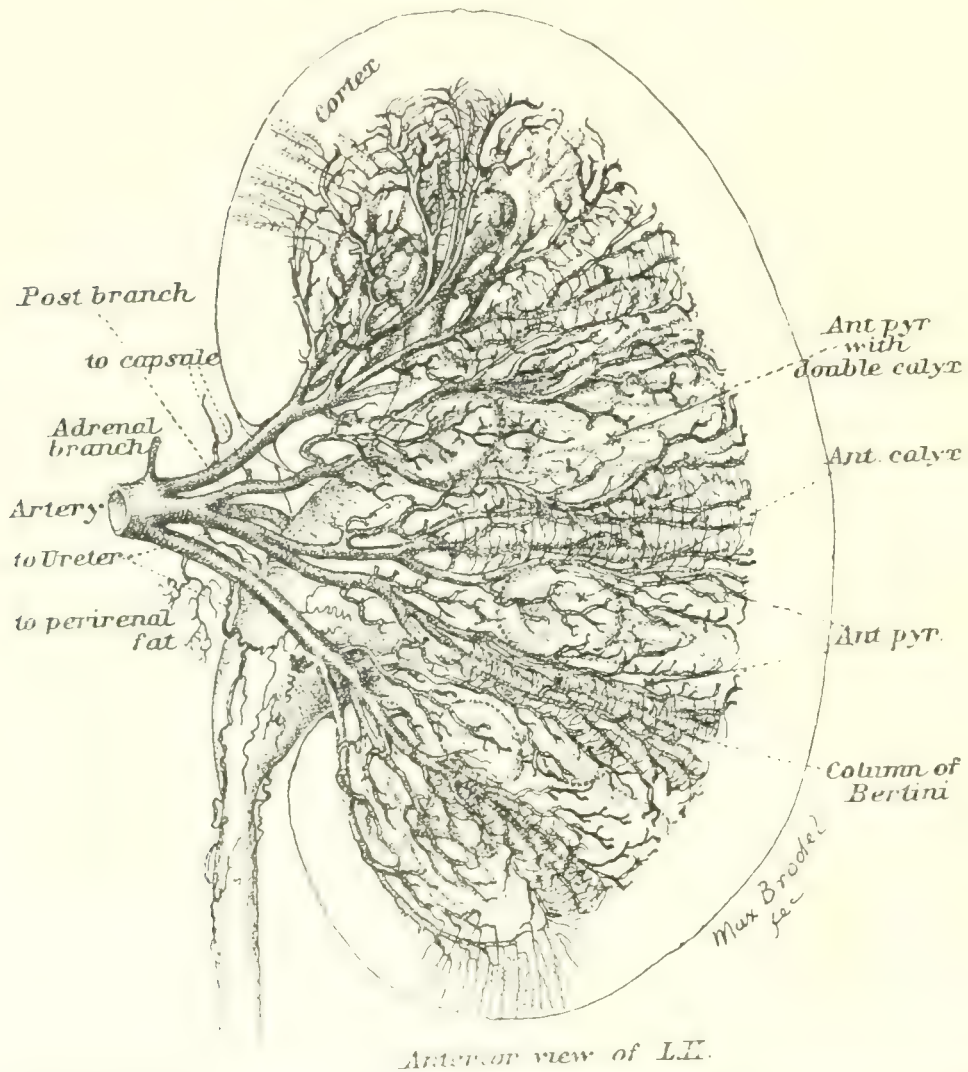
Broedel's white line. The best place to incise the kidney is through the lateral portion of the posterior pyramids parallel to Broedel's line and parallel to the posterior surface of the kidney, leaving about three-fifths of the kidney anterior and two-fifths posterior to the incision. (Figs. 11 and 12.) The cut should lie in a plane parallel to the posterior surface and not directed in a plane which would carry it to the centre of the organ. (Fig. 13.)

The structure of the kidney is found in about two-thirds of the cases. Sometimes the organ develops in such a manner that Broedel's white line lies further back. The posterior surface of the kidney will then bulge more than normal. If the palpating finger also feels that more vessels are pulsating posteriorly and anteriorly the incision may be made

about 1 cm. (0.4 inch) anterior to Broedel's line rather than the same distance posterior to it.

In suturing a kidney three sets of stitches may be employed—one of fine catgut, placed between the calyces; one of mattress sutures, extending through the whole thickness of the kidney, introduced with rather a blunt-pointed needle, to avoid wounding the vessels; and the third a continuous catgut suture of the capsule. (Fig. 14.)

FIG. 11.



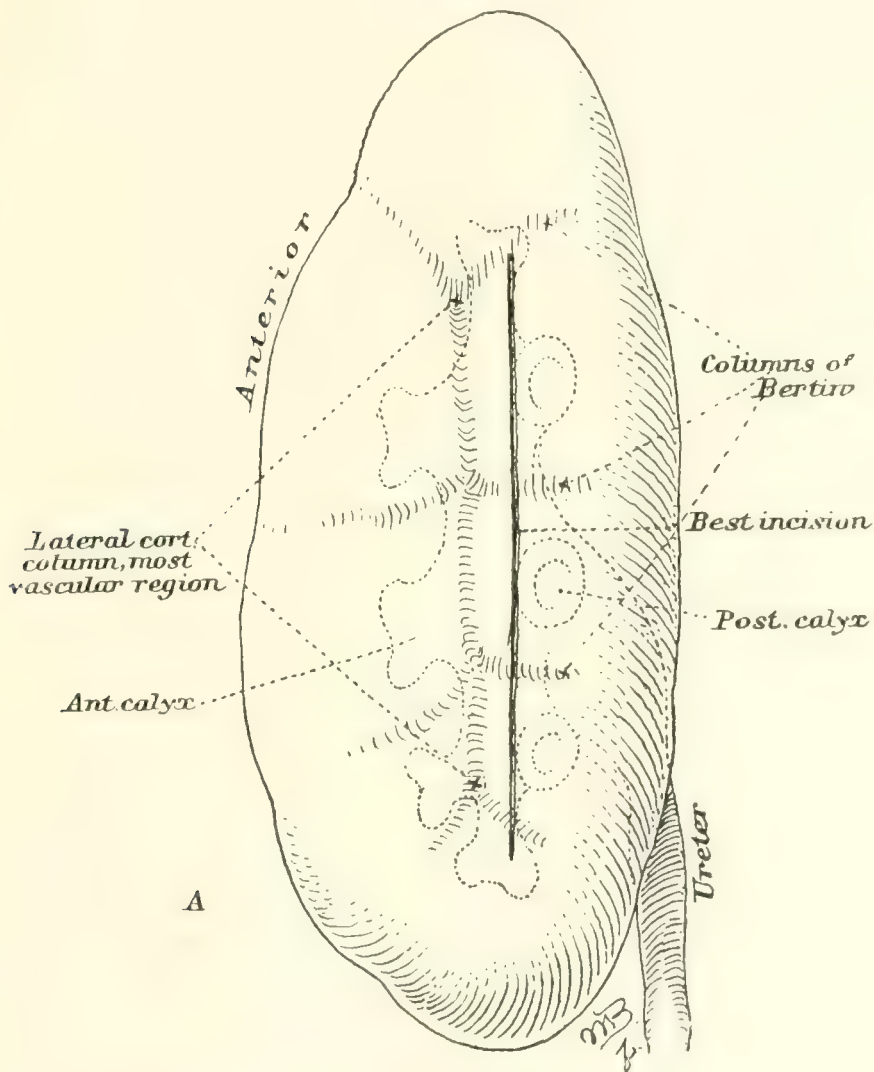
A transverse section through the middle of a left kidney. The anterior branches of the artery supply about three-quarters of the kidney substance, while the posterior branch supplies only a quarter.

The Technique of Nephropexy. Edebohls¹ has had a very extensive experience in anchoring movable kidneys, having performed this operation 261 times. He has modified his technique from time to time, but has at last developed what he considers an absolutely perfect method.

¹ Annals of Surgery, February, 1902.

The steps in the operation are as follows : Place the patient prone upon the table, with a kidney air cushion supporting the abdomen. (Fig. 15.) Make a straight incision along the outer border of the erector spinae from the lower border of the last rib to the crest of the ilium. Bluntly separate the fibres of the latissimus dorsi without opening the sheath of the erector spinae. Split the transversalis fascia and expose the perirenal fat. Draw the iliohypogastric nerve to one side or other, out

FIG. 12.

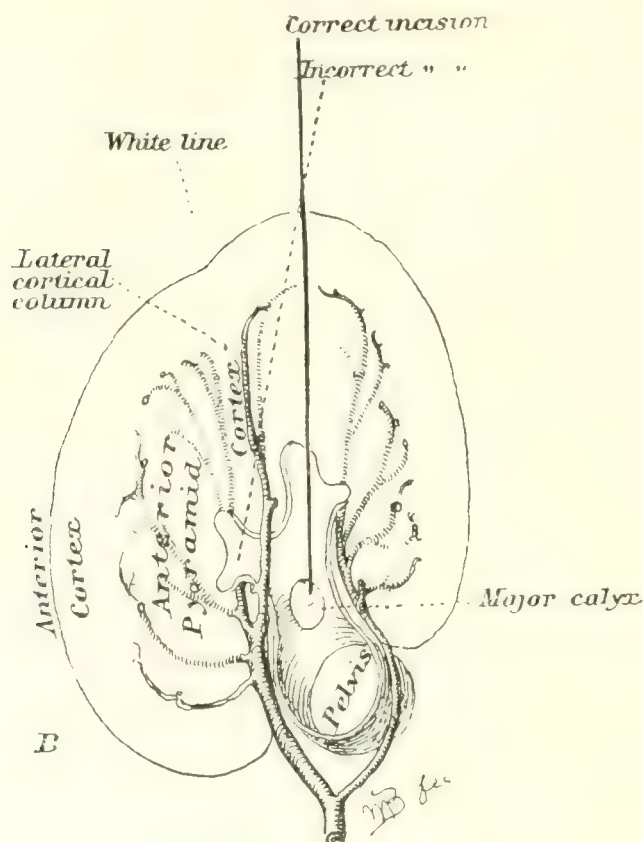


Lateral view of kidney.

of the way of injury. If this cannot be done, and the nerve must be divided, reunite the severed ends with catgut after anchoring the kidney.

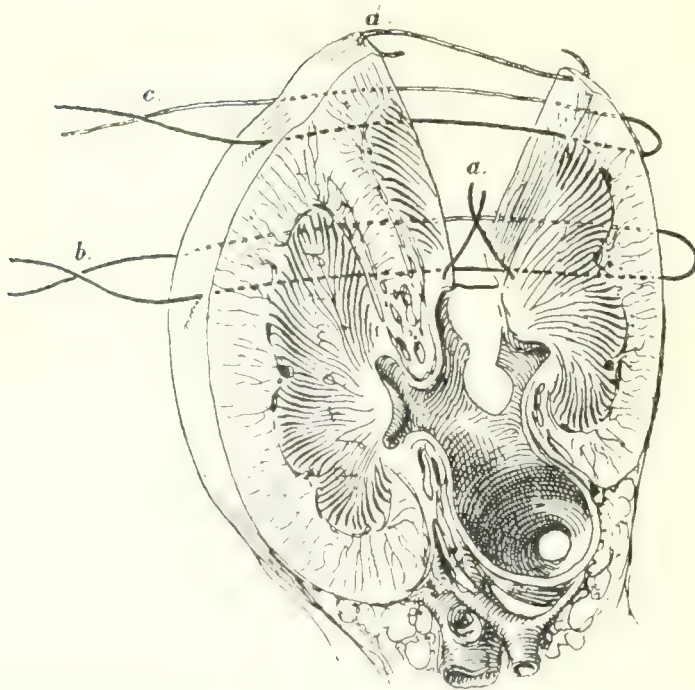
Open the sheath of the quadratus lumborum from the rib to the ilium along the anterior aspects of its lateral border. Free the kidney and deliver it with its fatty capsule through the wound on the back. Should the opening through the walls of the abdomen prove too small for delivery of the kidney, enlarge it by nicking the outer fibres of the quadratus near its iliac insertion. Dissect off and remove the whole of

FIG. 13.



Sectional view of kidney.

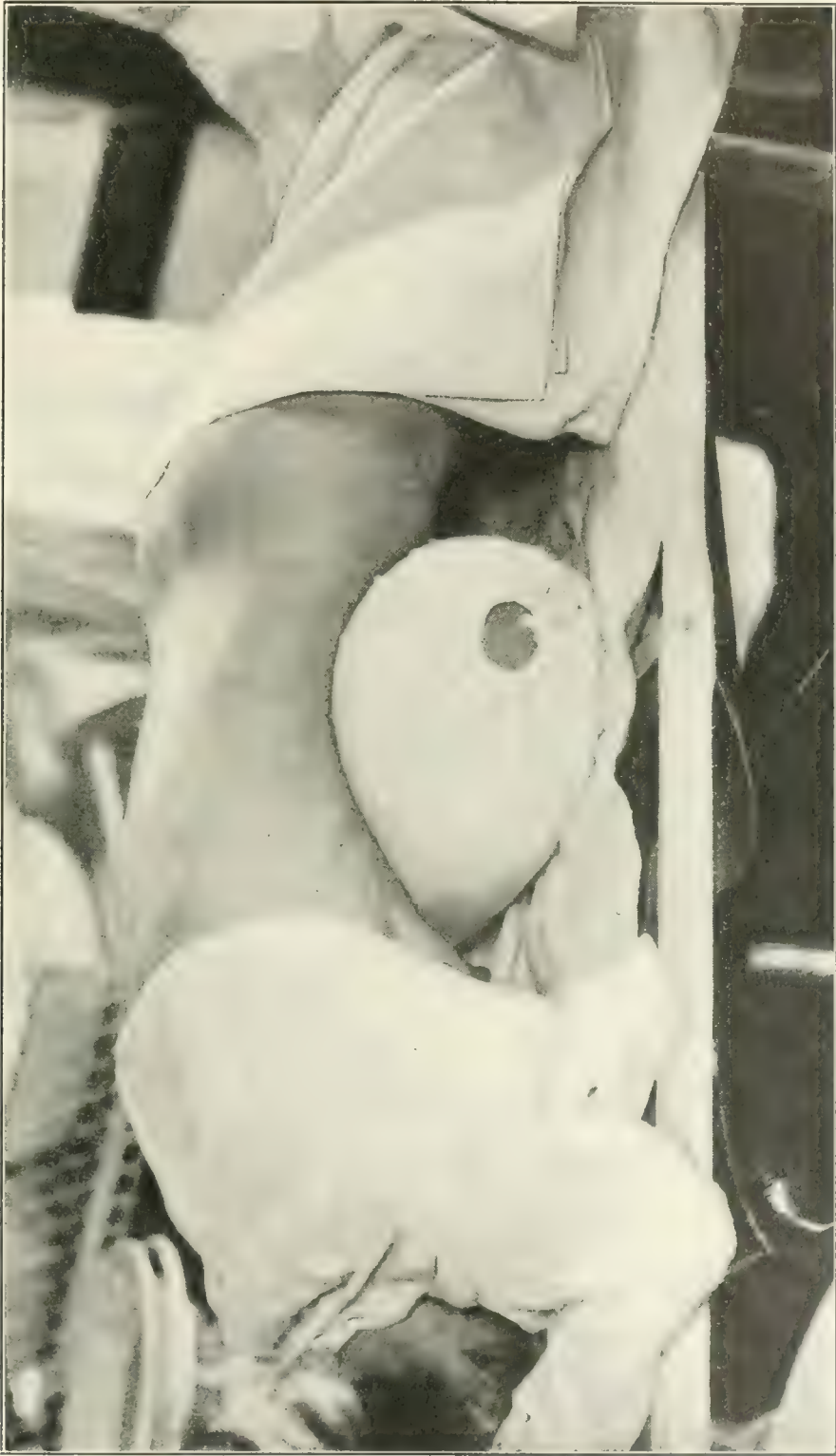
FIG. 14.



Method of approximating the two cut surfaces : *a*, catgut sutures approximating pelvis (can be dispensed with) ; *b*, deep catgut mattress sutures passing as much as possible through cortical substance, avoiding the pyramids. They are best placed with a long, straight, three cornered needle with blunt point in order to avoid injury to large vessels. The needle should not be thrust or forced through the kidney, but its blunt point should be allowed to feel its way through the parenchyma, avoiding all structures that offer greater resistance than the safe cortical substance ; *c* is a second system of mattress sutures which may be dispensed with, if the first row of deep sutures produce the desired effect ; *d* is the usual suture of the capsule.

the fatty capsule, exposing the capsule proper throughout its entire extent. Nick the capsule proper of the kidney near the middle of the convex surface sufficiently to admit a grooved director. Divide the

FIG. 15.

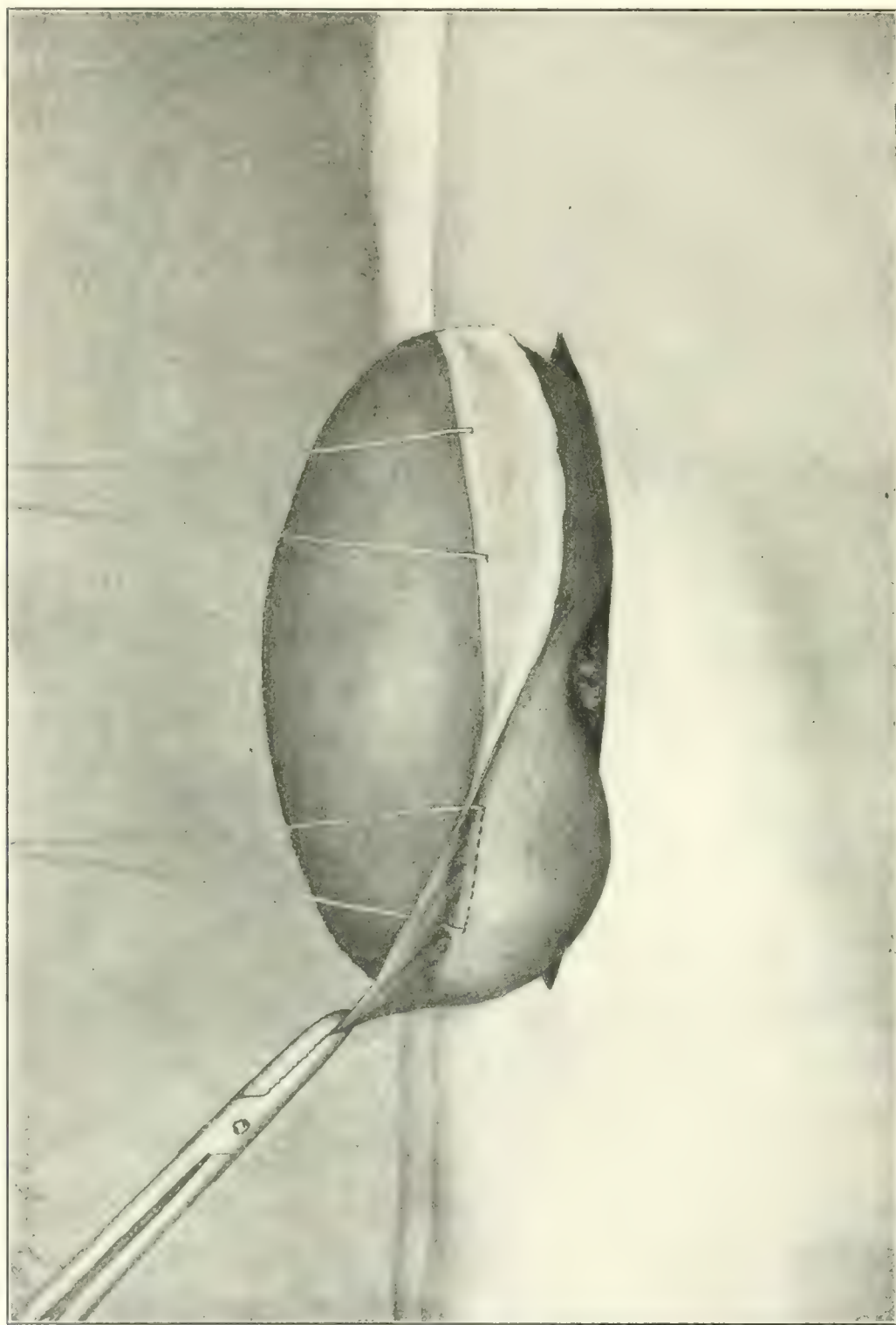


Edebohl's kidney air-cushion, with patient in position for operation.

capsule on the director from pole to pole. Reflect it on either side of the kidney half-way to the hilum. Pass four fixation sutures of "forty-day catgut" through the capsule close to its reflection. (Fig. 16.) Re-

place the kidney within the body and pass the suture through the abdominal parietes from within outward. (Fig. 17.) Tie the sutures under moderate tension, and suture the groove in the muscles as well as the incision in the skin.

FIG. 16.

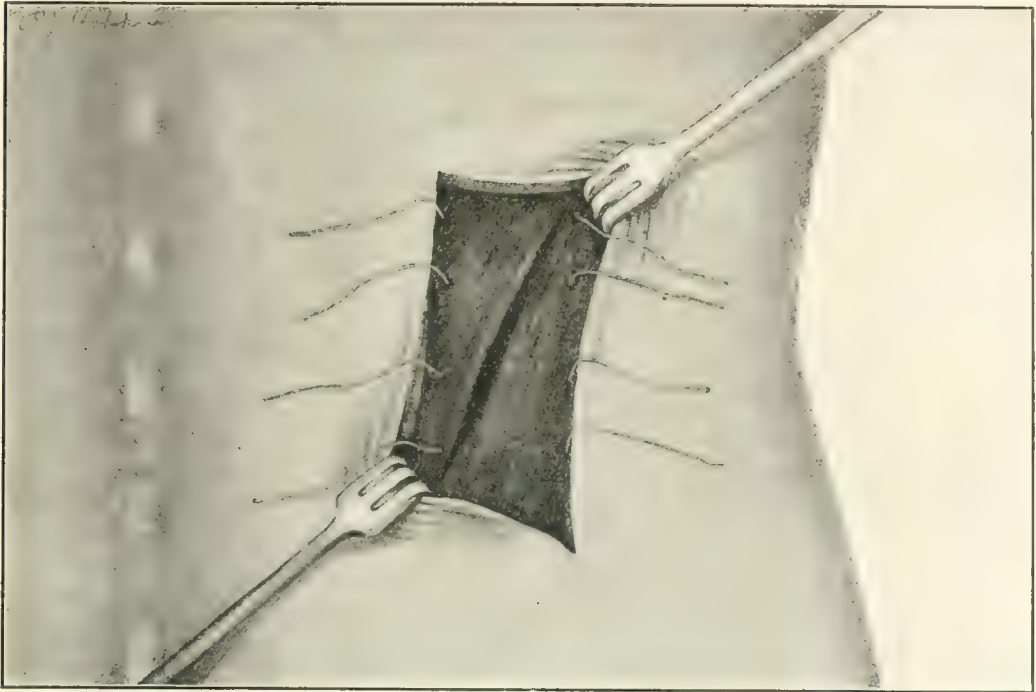


Showing two of the four suspension sutures passed through reflected and attached layers of capsule proper, without penetration of kidney substance. The two companion sutures, passed on the opposite face of the kidney, are not shown.

Edebohls is well pleased with the results of this operation—indeed, with the results of the numerous operations that he has performed since he began to suture kidneys in 1890. He was at one time of the opinion

that relapse occurred in some of his operative cases ; but since he has changed the standard by which a relapse is to be measured he has had no failures. He now claims that a kidney sutured in the line in the manner described can never be pushed up into its normal position under the ribs, and that unless it can be so disposed upward it should not be considered to have become detached.

FIG. 17.



The kidney has been replaced and the ends of the suspension sutures have been brought through the abdominal wall, emerging on the outer surface of the latissimus dorsi. The fibres of the muscles have been separated from each other, not cut, in making the incision.

Conservative Treatment of Movable Kidneys. Morris,¹ who has also had a large experience in nephropexy, takes a less radical view in regard to the necessity for operation. His conclusions are as follows :

1. When movable kidney is associated with enteroptosis no operation should be performed on the kidney unless it is evident that the more serious symptoms are due to the mobile kidney alone and not until after the trial of a well-fitting abdominal support and the careful dietetic and medicinal treatment of the gastric and intestinal disorders. Should these means fail, and the kidney evidently be most at fault, nephropexy, followed by the wearing of an abdominal belt, should be tried.

2. When a movable kidney is complicated by a movable liver, or when both kidneys move, the same rule should be followed as in general

¹ *Annals of Surgery*, February, 1902.

enteroptosis; in the case of both kidneys moving (when both organs have been giving trouble) they should be fixed one after the other, at an interval of a week, so that convalescence from both operations may be taking place simultaneously.

3. When the movable kidney occurs in a hysterical or neurasthenic patient all palliative means should be tried before resorting to an operation, and the patient's friends should be informed of the uncertainty of the result from operation. The statistics show that a cure may be hoped for by nephropexy in about one-half of their cases.

4. For uncomplicated movable or floating kidney in which the principal symptoms are pain and gastro-intestinal troubles the operation may be confidently advised and carried out without any previous trial of belts or of rest.

5. When renal crises are a feature of the case nephropexy ought to be strongly urged, because of the impossibility of keeping the kidney in its proper place by a belt and because of the constant risk of hydro-nephrosis and recurring pain, even if the renal crisis can be kept under control.

6. When a movable kidney gives rise to no inconvenience an operation ought not to be thought of, and a belt need not be worn.

Rose¹ argues against the "floating kidney idolatry." He believes that great benefit may be often obtained by strapping the abdomen in patients who have splanchnoptosis, and that it does more good than nephropexy. His experience tells him that one is not justified in resorting to operation in cases of splanchnoptosis without first having tried the method of supporting the abdominal muscles, and that the method of strapping seems to be the best of all. He also holds that we are not justified in pointing out the floating kidney as being especially the cause of gastric and nervous symptoms in cases of splanchnoptosis.

We believe that only a small proportion of patients with movable kidney require operation, and we thus seldom advise operation until a belt has been tried. We are convinced that many of the symptoms so readily attributed to the movable kidney have no connection with this condition.

Tumors of the Capsule of the Kidney belong to the rarities of surgical experience, yet Bork² has been able to collect twenty-four cases of operation therefor. In most instances the tumor was found to be a lipoma or fibrolipoma, while in others it proved to be a myoma or sarcoma or a combination of these elements. In a single instance smooth

¹ Medical Standard, Chicago, February, 1902.

² Archiv f. klin. Chir., 1901, Band lxxiii., S. 928.

muscular fibre and bony tissue were found in a tumor of the capsule of the kidney. The average weight of the tumor was ten or fifteen pounds. The smallest one mentioned weighed four pounds, while several of them ranged from twenty to fifty-eight pounds. The kidney was often removed with the tumor, either because it was supposed to be diseased or on account of the close attachment between it and the tumor; but in every instance it was found to be healthy and not involved by the new-growth. This is a most important fact to remember in dealing with tumors of this character, both in order to save a sound kidney whenever possible and to lessen the risk of death from operation.

Six of the twenty-five patients died during or soon after operation, two of them dying before the tumor could be removed, three after removal of the kidney and tumor, while only one of the patients from whom the tumor alone was removed succumbed to the operation. It is also worth notice that all of the deaths from operation were reported previous to 1888. Since then there have been reported twelve operations, without a death. If the tumor is a sarcoma or myxosarcoma a recurrence is of course to be expected. A myxolipoma is on the border-line of malignancy, and may or may not recur after removal.

GENITAL TUBERCULOSIS.

Removal of Seminal Vesicles. Young¹ describes a new operation for the removal of the seminal vesicles together with a portion of the prostate, vasa deferentia, and testicles. He makes a linear incision from the pubes upward to the umbilicus, and then divides both recti muscles transversely. The subsequent steps in the operation are the separation of the peritoneum from the vertex of the bladder and from the posterior wall of the bladder; isolation of the vasa deferentia and seminal vesicles; division of the vasa at the external rings; excision of the testicles and the remainder of the vasa deferentia; suture of the divided recti muscles; and closure of the median incision, except a space for gauze drainage by the bladder. (Figs. 18 and 19.) The removal of the testicles through this incision is easily accomplished by separating the skin from the recti muscles in the neighborhood of the external ring.

Excision of the seminal vesicles, first performed by Ullmann in 1889, has now been carried out in thirty-four reported cases of tuberculosis of the seminal vesicles associated with testicular disease. The methods of reaching the seminal vesicles may be thus classified:

¹ *Annals of Surgery*, November, 1901.

- A. Puncture.
 Rectal.
 Perineal.
- B. Incision.
 Rectal.
 Perineal.
1. Inguinal method of Villeneuve, 1891.
 " " Zuckerkindl by Ullmann, 1889.
 " " Roux, 1891.
 2. Perineal " Von Dittel by Schede, 1893.
 " " Guelliot, 1895.
 " " Baudet, 1898.
 3. Sacral " Kraske by Schede, 1895.
 " " Rydygier by Schede, 1895.
 4. Suprapubic " Young, 1900.

FIG. 18.



Showing seminal vesicles and portion of the vasa deferentia; also right and left testicles.

Space is lacking for a description of all these different methods. The inguinal method of Villeneuve consists in following the vas deferens through the inguinal canal by enlarging upon the usual inguinal hernia incisions, freeing the vas along its course around the bladder, isolation of the seminal vesicle around the side of the bladder, and excision of both the vesicle and vas deferens.

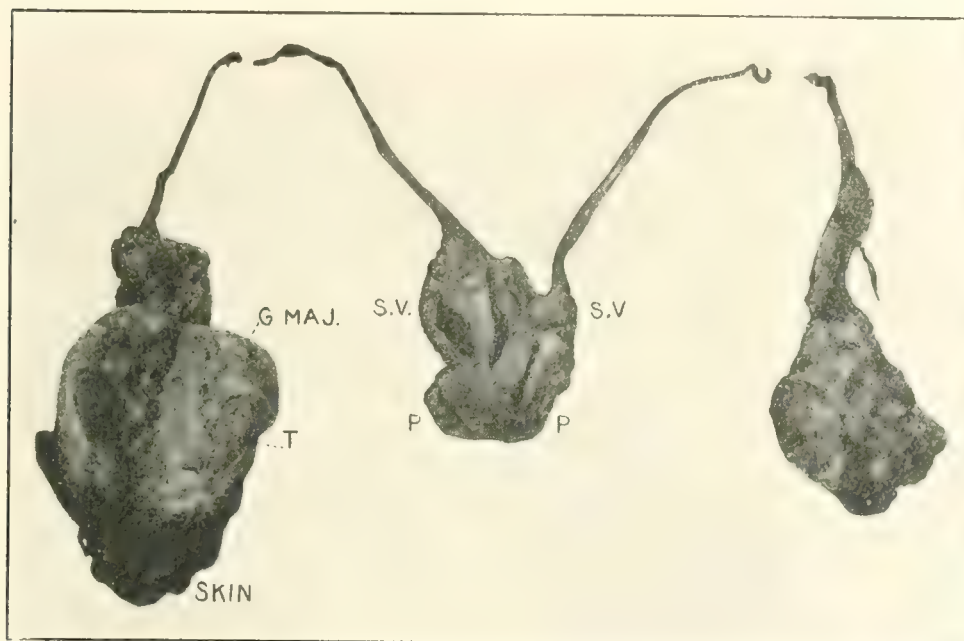
In the perineal method, first employed in 1889, Ullmann made use of the Zuckerkindl curved transverse-perineal incision, the dissection

being carried through the levator ani, with isolation and excision of the vesicle and vas deferens, which had been loosened from its higher attachments by an inguinal incision.

The method of Roux has been the most largely used. The sacral method has been used by Schede through both the Kraske and Rydygier incisions, the rectum being pushed to one side and the vesicle thus isolated and removed.

It is a remarkable fact, but one essentially proved by many recorded cases, that the simple removal of testicular tubercular foci may be followed by the disappearance of extensive tuberculosis of the prostate, seminal vesicles, bladder, kidneys, lungs, etc.; hence the necessity for

FIG. 19.



The two seminal vesicles removed with the adjacent prostate; the testicles split open for examination.

the more serious operation of the removal of the seminal vesicles is far less than one would suppose. Moreover, the results which have followed the removal of the seminal vesicles are not so good as those which have been reported after the removal of testicular foci or after castration if the disease in the testes was extensive. Indeed, Young is frank enough to admit that a study of the literature has so changed his views that he does not now advise operation upon tuberculous seminal vesicles.

The operation of choice is *epididymectomy*, with high resection of the vas deferens. Castration should be confined to cases where the testicle proper is involved or the scrotal disease is extensive. Double castra-

tion should be avoided if possible, a portion, at least, of one testicle being left, even at the risk of local recurrence of the disease.

Castration for Tuberculosis of the Testicle. The question of castration for tuberculosis of the testicle has become an important one, says von Bruns¹ in a recent paper "On the Final Results of Castration in Tuberculosis of the Testis." While the opinions of various men differ widely as to details, the majority are against castration, particularly against bilateral castration. The reasons of the one class for are in sharp contrast to those of the other against castration, and the question arises, Who is right? In view of this uncertainty, he states, he has long felt the desire to institute exact investigations as to the results of castration as hitherto practised by him. Comprehensive statistics covering the various methods of treatment are lacking, the material so far brought forth during discussions of the question generally comprising but a small number of selected cases cited to prove the respective stand-point taken.

von Bruns, assisted by Haas, has therefore collected the material at his command at the Tübingen clinic, covering a period of fifty years, and has used great diligence in tracing the cases to final results. He found 111 available cases, in which the time of observation extended up to thirty-four years. Of these 78 were unilateral, 33 bilateral castrations. He mentions that only the typical method of castration, with high resection of the vas deferens, was used, the seminal vesicles and prostate not being interfered with.

In order to form an idea as to the significance of resection of the epididymis he ascertained the frequency of involvement of the testicle, and found that the same was involved within the first two months in 18 per cent. of the cases; within the first three months in 24 per cent.; within the first six months in 40 per cent.; where the disease had existed more than six months, 60 per cent. Thus we see that the testicle had become involved in 40 per cent. of the cases in which the disease had existed up to six months, and this, as is well known, often occurs without any clinically noticeable changes. It is plain, therefore, that resection of the epididymis here means only half work.

Another point of great importance, von Bruns states, is that of the extension of the disease to the other testis—bilateral tuberculosis of the testis. That it is frequent is known. According to a paper from the Bern clinic, it is estimated to constitute 75 per cent. of all cases. At von Bruns' clinic 38 per cent. of the cases were bilateral, and in four rare cases the disease most probably started simultaneously on both sides. In only 23 per cent. of the unilateral castrations did the disease

¹ Arch. f. klin. Chir., 1901, vol. lxxiii., No. 4.

later start on the other side ; therefore, if it be true, as is generally assumed, that at least one-half of the cases of tuberculosis of the testis later become bilateral, early castration would seem to offer considerable protection against the disease later appearing in the other testicle. He adds that with but two exceptions involvement of the second testicle was noted to occur later than three years after unilateral castration.

Of the patients in whom unilateral castration was performed 12 per cent. died of urogenital tuberculosis ; in nearly all of these a diseased condition of the urinary organs had existed at the time of operation. Fifteen per cent. died of tuberculosis of other organs, principally the lungs, which, however, generally had existed already prior to castration. In 26 per cent. of the cases tuberculosis of the second testicle was later observed and generally treated by further castration. Forty-six per cent. of the patients in whom unilateral castration was done were permanently cured, the time of observation extending from three to thirty-four years.

Of the patients in whom double castration was performed 15 per cent. died of urogenital tuberculosis, thus showing that the majority were still cured by the second operation, and, further, proving that bilateral tuberculosis of the testis may exist entirely isolated. Twenty-five per cent. died of tuberculosis in other organs. Fifty-six per cent. of the cases in whom double castration was done were permanently cured, the time of observation extending from three to thirty years. Psychological changes were not noticed in any of the patients, although all those who are still living were personally examined by von Bruns.

All in all, it may be said that one-half of the patients in whom castration was done were permanently cured. This, however, is counting only those where the disease was still confined to the genital organs. Nearly all of the cases in whom the disease extended to the urinary organs died ; the same is true of those who at the same time suffered from tuberculosis of other organs. For these deaths, of course, castration cannot be made responsible.

von Bruns concludes by saying that the results of castration for tuberculosis of the testis are evidently more favorable than is generally conceded, and the condemnatory judgment passed on castration is certainly not justified.

LARGE INTESTINE AND RECTUM.

Cæcal Fistula in Chronic Colitis. The plan of establishing a cæcal fistula in chronic colitis, in order to free the colon from fecal irritation and to permit of systematic irrigation, has been advocated by a number of writers ; but it has not often been carried out, on account of the dis-

agreeable condition in which a patient with a fecal fistula in any portion of the intestinal tract usually finds himself. Bolton¹ applied to the fistula made in the cæcum the valvular procedure so successfully carried out by Kader in gastric fistulae. Three rows of stitches were inserted in the cæcum, the row placed furthest from the incision into the bowel serving to attach the cæcum to the abdominal wall as well as to help in the invagination of the fistula into the bowel lumen. The result was a perfect one. The bowel was at once irrigated through the catheter, which was left *in situ* for a week. After that it was inserted daily for the purpose of irrigation. There was never any leakage on removal of the catheter, even though the cæcum was fully distended. The irrigations were practised twice a day for three days, and then once a day for eleven days, and after that every other day for about two weeks. At that time the diarrhoea had long since disappeared, and the mucous membrane of the rectum and sigmoid seemed normal. The irrigating fluid first used was a 0.01 per cent. solution of nitrate of silver, which was later increased in strength to a 0.02 per cent. solution. This was always followed by an irrigation with normal saline solution. The fistula healed in twelve days after the catheterization was stopped.

Rectal Prolapse. A. E. Halstead² thus sums up the treatment of rectal prolapse :

1. In all cases of prolapse of the mucous membrane alone the protruding portion should be cut off and the upper line of the incision sutured to the skin as in Whitehead's operation for hemorrhoids.

2. In recent reducible prolapse of the rectum massage, gymnastics, and internal medication should be first tried. If these measures fail intra-abdominal suspension or amputation is indicated.

3. Prolapse in young children seldom requires operative treatment. Rest and defecation in the horizontal position, tonics, and massage will almost always effect a cure.

4. Amputation is indicated in old irreducible or recent strangulated cases.

5. Intra-abdominal fixation is not dangerous, is easily performed, and, when not successful, does not leave the patient in a worse state than before. Inguinal colostomy should never be performed unless some special indication for it exists; for example, when prolapse is associated with obstinate colitis or with malignant disease.

6. The disadvantages and dangers of rectopexy outweigh its good points.

¹ Medical Record, March 16, 1901.

² Journal of the American Medical Association, 1901, vol. xxxvii. p. 1730.

Carcinoma of the Cæcum. Cancer of the large intestine was dealt with rather fully in our last article in *PROGRESSIVE MEDICINE*, June, 1901. The recent paper of Cumston and Vander Veer¹ contains an elaborate review of the cases thus far reported, together with valuable remarks upon the symptomatology, diagnosis, and treatment of this lesion.

The early symptoms of carcinoma of the cæcum are classed in the following order: (1) Pain; (2) alternating diarrhoea and constipation; (3) loss of flesh; (4) dyspeptic troubles; nausea, vomiting, loss of appetite; (5) intestinal hemorrhage. Occasionally, however, the earlier symptoms are entirely wanting, and the first thing observed is the presence of a hard mass in the right iliac fossa. Very frequently they closely simulate attacks of chronic appendicitis, and not a few of the operations for carcinoma of the cæcum have been performed on the supposition that the trouble was appendicitis. The writers state that the physical character of the tumor is found to vary, sometimes being rounded in shape, the size of a walnut, with a hard, smooth surface, dull on percussion. At other times the surface is irregular and lumpy, while the tumor may be the size of a fist or larger, and varying in consistency. Occasionally ascites is observed. The tumor at first may be movable, but soon becomes bound down by adhesions and comparatively fixed. The duration of the disease is very variable, Cumston and Vander Veer estimating that in most cases it seldom takes longer than a year or eighteen months to accomplish its evolution. Generalization of the growth by contiguity in the mesentery and its lymphatics is said to be not infrequent. The peritoneum may also become invaded. In cases of doubtful diagnosis it is important to thoroughly empty the bowel by purgatives in order to eliminate fecal impaction. Tuberculosis of the cæcum is said to be most likely to cause error in diagnosis; sometimes it is impossible to differentiate the two lesions. Personally, I believe that carcinoma of the cæcum has been more often mistaken for chronic appendicitis than any other trouble. In differentiating intestinal occlusion due to carcinoma from other varieties, Cumston and Vander Veer state the general shape of the abdomen will approximately indicate the seat of obstruction; when there is a distention of the peri-umbilical region and the epigastric region, with a depression over the iliac fossa, the seat of the obstruction is probably in the middle of the small intestine; when the obstruction is in the descending colon or sigmoid flexure the distention is more generalized, with a projection of the distended large intestine, and vomiting occurs later than when the obstruction is in the small intestine. The amount of urine voided is greater the

¹ *Annals of Surgery*, January and February, 1902.

lower the obstruction. The amount of fluid it is possible to introduce per rectum is also of some value, a litre being necessary to fill the rectum; if any more than one-and-a-half litres can be introduced the obstruction is probably in the sigmoid. The only treatment for carcinoma of the cæcum the writers believe to be total extirpation.

With regard to the technique of the operation for removal of a carcinoma of the cæcum, Körte mobilizes the tumor before he cuts the intestine, having first separated the gut and tied all of the adhesions which are nearly always present. Escape of feces can usually be controlled by the proper application of clamps. It is unnecessary to describe in detail the various methods of uniting the large and small intestine. One may decrease the orifices of the colon, increase the calibre of the ileum, or close up both the ends of the intestines and make a lateral anastomosis between the ileum and colon, or close the colon and make a lateral implantation of the ileum into the colon.

The writers report two personal cases—one of Dr. Cumston and one of Dr. Vander Veer. In Dr. Cumston's case there was an annular carcinoma situated at the junction of the cæcum and ascending colon. The patient's condition was bad, and nothing more than an artificial anus was made, in the hope of completing the resection of the intestine later. The patient, however, did not rally, and died twenty hours after operation.

The second case—that of Dr. Vander Veer—is of special interest, inasmuch as it illustrates the fact that carcinoma in any portion of the large intestine may occur in very young individuals. His patient was a young lady of only twenty-one years of age. In this case it was impossible to make out a distinct tumor before the operation. The diagnosis prior to operation was “chronic appendicitis.”

A hard, stricture-like band of tissue was found obstructing the greater portion of the cæcum; the mesenteric glands were apparently free from infection. The distal end of the cæcum was united to the end of the ileum by means of a full-sized Murphy button, the entire operation occupying one hour and fifteen minutes. The patient died four days after operation. There was no evidence of hemorrhage; there was good union of peritoneal surface and intestinal wound at the point of anastomosis, and while there was no rupture, yet near the mesenteric attachment of the ileum there was a dark spot, which would have perforated beyond a doubt in the passing of the button. There was no evidence of peritonitis, and cultures made from the peritoneal cavity did not show sepsis. Vander Veer believes that possibly this was a case of auto-infection. He states that if he were to do the operation over again he would certainly close the cæcum and do a lateral anastomosis to the ileum.

This I believe to be a much wiser and safer plan. It is a method which I personally employed nearly three years ago in a case reported in the *Annals of Surgery* (1899), and inasmuch as this patient lived longer than the great majority of cases hitherto operated upon, I will repeat in brief a few of the details :

The patient, a physician, aged forty-two years, was operated upon in April, 1899, at Toronto, Canada, for supposed chronic appendicitis. He was found to have a large carcinoma, involving the lower end of the cæcum and also, by contiguity, a loop of adherent small intestine. The wound was closed, as it was thought unwise to attempt the removal of the growth. The patient consulted me as to the propriety of making any further attempt to save or prolong his life, and, after careful deliberation, I decided to remove the growth, if possible, by total resection. The patient was operated upon in May, 1899, after thorough and careful preparation. The growth was bound down by adhesions, which were finally separated, making it possible to bring the cæcum well up into the wound. About seven inches of small intestine containing the portion invaded by the carcinoma were first severed and an end-to-end anastomosis made by means of a medium-sized Murphy button. The entire cæcum was then dissected free and removed. Both ends of the ascending colon and ileum were closed by Lembert sutures, and a lateral anastomosis of the lower portion of the ileum and the ascending colon was made by means of a large-sized oblong Murphy button. The wound was closed with the exception of a small gauze drain. The entire operation lasted but little over an hour. The patient made an excellent recovery. Both buttons were passed through the rectum on the ninth day, and he returned to his home on the 21st, with his wounds entirely healed and bowels moving freely. He remained in very good health for about a year and a half, when he had symptoms of returning trouble, shown by slight pain. Locally a hard mass could again be felt in the iliac fossa, with some slight distention of the bowels and slight constipation. The symptoms slowly increased in severity, and he finally died in the summer of 1901, twenty-six months after operation.

This I believe to be one of the most extensive operations for carcinoma of the cæcum yet recorded, and the duration of life after the operation among the longest.

ENTERECTOMY FOR CARCINOMA OF THE CÆCUM. Goullioud, of Lyon, at the last French Congress of Surgeons,¹ reports six cases of enterectomy for cancer of the cæcum, with one death. The author believes lateral entero-anastomosis preferable to circular enterorrhaphy, especially when we are dealing with intestines of different calibres.

¹ *Revue de Chir.*, No. 11, p. 560.

The final results are of great interest, one of the patients remaining well for three years, one one year, one five months, one four months, and one three months after operation.

Tuberculosis of the Intestine. The *Deutsche Zeitschrift f. Chirurgie* of March, 1901, contains a very interesting article by J. Sørensen on stenosis of the small intestine due to tuberculosis, with a report of three cases of stenosis of the ileum treated at Hahn's private clinic, Berlin, within the last three years.

Sørensen believes that tuberculosis is one of the commonest affections of the intestine; he cites Heinze's statistics, according to which, in 1226 cases of phthisis, tuberculous intestinal abscesses were found in 630. He further mentions Fenwick and Dodwell, who found the intestine invaded by the disease in 500 out of 883 autopsies; and in the statistics of Eisenhart intestinal tuberculosis was found in 566 out of 1000 cases of phthisis. That, in view of this great frequency of intestinal abscesses, cases of stenosis of the intestinal lumen are comparatively rare, is due to the fact that tuberculous processes in the intestine show still less tendency to remain localized than in other organs. In Fenwick and Dodwell's cases the ileocæcal region was affected in 85 per cent. of all cases, and it was found that the tendency to tuberculous infection decreases the further away from Bauhin's valve the respective intestinal portion is situated; thus, the ileum was found diseased in only 28 per cent., and the duodenum in but 3.4 per cent. Sørensen states that while very frequently the disease extends upward from the region of Bauhin's valve, finally involving the entire intestine up to the pylorus, it may also occur that solitary or multiple foci are formed in the small intestine, more or less extensive stretches of perfectly healthy intestine intervening between such foci, so that upon the healing of several annular abscesses stenosis may be produced in various portions of the tumor at the same time.

Hofmeister, who in 1896 collected all the cases of multiple strictures of the small intestine then known, mentions one case in which twelve annular strictures were found within a little over six feet of intestine.

Sørensen also refers to the well-known case of Köberlé (1881), operated upon twelve times for multiple tuberculous stricture of the small intestine, and briefly notes eight other cases by the same author in which the small intestine was strictured from two to twelve times. In two of Sørensen's cases ten circular strictures of the lower ileum were found, and in both instances there was a coexisting tuberculosis in the ileo-cæcal region.

Inasmuch as the symptoms of stricture of the small intestine caused by tuberculosis do not differ from those due to other causes; and as, furthermore, no conclusions can be drawn from the appearance and

course of the disease in regard to the number of cicatricial constrictions present, it has not been possible so far, Sørensen states, to render the diagnosis of multiple strictures before the abdominal cavity is opened.

Intestinal tuberculosis he believes to be secondary in the great majority of cases, being generally associated with phthisis. A few isolated cases have been reported in which the tuberculous secretions of other parts of the body infected the intestine and in which no phthisis was present.

With regard to the question of primary tuberculosis of the intestinal tract, opinions differ. Klebs, for example, denies that tuberculosis is ever primary in the intestine; Leube declares that he has never met with this form of tuberculosis.

It must be admitted, Sørensen adds, that most of the cases that have been published within the last few years as primary tuberculosis of the intestine could not be proven to be such on more careful investigation.

On the other hand, some cases of undoubted primary tuberculosis of the intestinal tract have been reported. Eisenhart claims to have found one such case in his series of 366. Wyss, in seventy-five autopsies on children, found three in which the respiratory organs, cervical glands, bronchial and tracheal glands were shown to be absolutely free, while the intestine was certainly affected with tuberculosis; also, in two of Sørensen's cases tuberculous disease of the lungs or other organs could not be proven, nor has later observation of the cases revealed any symptoms of lung affection, and one of his patients has remained perfectly healthy to date, six years after operation. It is not unlikely, therefore, that in these two cases the disease was primary in the intestine. Similar cases have been reported by others.

As regards treatment, Sørensen states that while the various palliative measures known may retard the appearance of intestinal obstruction the basic trouble itself is not influenced by such treatment, and operation—*i. e.*, the radical extirpation of the entire tuberculous portion of the intestine—is the only means by which a cure may be effected.

Hofmeister reports 34 cures and 15 deaths in a series of 50 total resections for simple stricture. More recently the results are still better: Kocher has reported 16 cures in 18 resections, and Körte 11 resections without mortality.

However, when it comes to multiple stenosis, necessitating the removal of very large portions of small intestine, Sørensen states, the question assumes a different aspect, although quite a number of cases are known in which extensive resections have been successfully done. Thus, Trzebicky was able to collect eight cases up to 1893 in which up to 280 cm. of intestine were removed. Later, Budberg reports a resection of 175 cm.; Ruggi and Fantino, even 310 to 330 cm. Hahn, too, in

the year 1887, reported two cases in which 1 metre of cæcum and ileum were resected with good result, and more recently he has obtained a cure in a case in which 10 cm. of small intestine were resected, while a fourth case, with resection of 300 cm. of intestine, ended fatally.

The results of operation for multiple strictures are by far inferior to those obtained in operations for solitary ileocaecal tuberculosis. This is well shown by Hofmeister's statistics, where in thirteen operations for multiple stenosis five deaths occurred.

In the three cases of Hahn reported by Sørensen the condition of the patients did not warrant the radical operation; hence simple lateral entero-anastomosis was done. One of the patients has remained well to date, six years after operation. In the second case the strictural symptoms, fever, and night-sweats disappeared immediately after operation. The patient has gained considerably in strength and weight during the twelve months that have elapsed since operation. The third case made an excellent recovery, and had no subjective symptoms whatever until four weeks after operation, when an abscess formed in the cicatrix. This opened, and a few days later the intestinal contents were evacuated through the abscess cavity. A tuberculous abscess had evidently become perforated. The intestinal fistula did not close again, and the patient died of exhaustion a few months after operation.

Andrews also reports four cases of *tuberculous peritonitis* limited to the region of the appendix. In regard to diagnosis, one is seldom able to differentiate this condition from various other lesions, for example, appendicitis, diseases of the tube and ovary, and malignant disease. In one case Andrews was able to make the diagnosis before the operation. In regard to treatment, he advises:

1. Laparotomy for simple exposure.
2. Excision of the omental masses and breaking up of the adhesions.
3. Artificial anus.
4. Partial resection of the wall of the cæcum.
5. Lateral anastomosis or partial exclusion.
6. Resection of the cæcum or total exclusion.

The table of Conrath shows the results following various methods of operation for both tuberculous and malignant ileocaecal tumors. Of 58 cases treated by extirpation 11 died; in 6 in which partial resection was done there were no deaths; entero-anastomosis 10, no deaths; complete exclusion 8, with 2 deaths; simple laparotomy 4, with 1 death, giving a total mortality of 16.25 per cent.

Sarcoma of the Small Intestine. In my last article in *PROGRESSIVE MEDICINE*, June, 1901, I discussed at some length sarcoma of the small intestine. A very valuable paper upon this subject has since been pub-

lished by Rheinwald,¹ reporting a series of 45 cases, 18 of which were operated upon, with a mortality of 38.8 per cent.; 22.2 per cent. are recorded as cures, although the time of observation after treatment was too short to justify one in regarding them as permanent cures.

Method of Excision of Gangrenous Intestines. J. Elgart,² in a recent paper "On the Indication and Methods of Excision of the Intestinal Wall in Gangrenous Herniæ," refers to the high mortality following resection for gangrenous intestine, especially where circular suture is employed, stating that none of the methods used can be called ideal; Murphy's button as well as circular suture occasionally fails us. The weak point of the latter, he says, is generally that of the mesenterial insertion. He mentions a case recently lost by him eight days after operation owing to the fact that the suture at the mesenterial insertion gave rise to circulatory disturbance, so that one of the borders of the wound became partially necrotic, although resection had been done 4 cm. from the primary necrosis.

There are cases, however, he states, where the gangrene does not involve the entire periphery of the intestine, but only portions of the wall, and the mesenterial insertion remains free. In these cases Elgart considers resection of the entire loop of intestine superfluous, but thinks that excision of the defective portion will generally be sufficient and preferable, because the weak point—that of the unreliability of union at the mesenterial insertion—is thereby circumvented.

Elgart states that Nedopil (director of the Brünn Hospital) first performed the operation of excision of the intestine three years ago, since which time 3 other cases have been operated upon. All 4 cases made an uninterrupted recovery. He adds that Maydl also successfully treated a similar case by excision.

Outside of these Elgart mentions 8 cases observed at the hospital during the past eight years in which pressure necrosis was treated by invagination, all of which recovered. In 1 instance invagination was done in a case where the loop had already become perforated. This patient died.

The method described by Elgart has proven absolutely reliable in all cases where perforation of the intestine had not yet taken place. There was not a single death and absolutely no complications.

Of course, the percentage of the cases that are suitable for excision is comparatively low. Of 73 cases of incarcerated hernia treated at the hospital during 1899 and 1900, 15 were gangrenous, and of these only 6, or 40 per cent., could be treated by excision or invagination. In the

¹ Beiträge z. klin. Chir., Band xxx. p. 703.

² Archiv f. klin. Chir., 1901, vol. xlv., No. 1.

remaining 9, or 60 per cent., resection was performed 8 times ; artificial anus established once.

With regard to indication, Elgart states that the kind of gangrene suitable for treatment by the method he describes occurs at two typical spots : (1) On the topmost spot of the strangulated loop ; (2) within the ring of incarceration. This, in all probability, occurs only in the loops of small intestine ; and in general, he states, it may be said that the former are suitable for excision, the latter for invagination.

A transverse suture should always be used in order to close the defect caused by excision ; the kinking of intestine that necessarily follows becomes straightened out very soon. Lembert's button suture is invariably employed—generally in two layers. The result of the same has been entirely satisfactory, also, in the resections.

After cleansing with sterile water the intestine is mopped dry and replaced. A strong strip of sterile gauze is introduced into the abdominal cavity ; partial removal of the hernial sac and partial suture (in inguinal hernia) of the abdominal wall ; a few stitches in the skin wound, the gauze drain resting in its lower angle. In crural hernia only the skin wound is partially sutured. After-treatment the same as in resections.

The treatment of the cases in which excision was performed took on an average of twenty-six days, primary union being excluded on account of the drainage. Otherwise the course of healing was entirely without reaction, as shown by the histories appended.

Although the percentage of cases of partial necrosis of the intestinal wall is comparatively small, and thus the opportunity for the employment of the simple excision method described rather limited, Elgart thinks that the latter must be considered a valuable method. Its rapid execution together with the good results obtained are its best recommendation.

Intestinal Resection. In the September, 1901, issue of the *Deutsche Zeitschrift f. Chirurgie*, Fuchsig reports 48 cases of intestinal resection done for various diseases, at Albert's (now Hochenegg's) clinic, during the last twelve years. Of this number 23, or 47.9 per cent., died, although only 19 succumbed to the operation as such, so that he places the mortality at the clinic at 35.5 per cent.

With regard to the technique, Fuchsig states that while formerly the circular suture was employed exclusively and without distinction, since the advent of lateral anastomosis—especially since the publication of Doyen's occlusion method—the latter has been given the preference.

In resections of the small intestine circular suture or the Murphy button was used in the majority of the cases. In resections in the region of the cecum the ileum end was usually implanted into the

ascending colon, and in resections of the large intestine lateral anastomosis was given the preference. The results obtained by lateral implantation and anastomosis were far superior to those seen after circular suture. In the latter series, nineteen in number, peritonitis occurred in six as a consequence of the insufficiency of the suture.

Fuchsig states that their experience with Doyen's occlusion method was particularly gratifying.

Both Murphy's button and continuous suture were used. The former, however, was decidedly preferred on account of its greater security.

Murphy's button was used comparatively often, even in resections of the large intestine, although the rule at the clinic is not to use the button in resections of the large intestine. The results obtained with the button were very satisfactory. In 12 cases there were 3 deaths. The button was not, however, passed as promptly as might have been desired, the majority of patients leaving the clinic before its passage, yet inquiry never elicited the report that this delay had caused any serious disturbance. Button anastomosis was nearly always secured by a few serosa sutures.

Resection of the intestine was done for carcinoma . . .	17 times.
Tubercular tumors	9 "
Invagination	3 "
Intestinal fistula and artificial anus	7 "
Incarceration of intestine	12 "

Resection for malignant tumors was done whenever the condition found on opening the abdomen was such as to make it seem possible to radically remove the neoplasm, provided always that the resorptive capacity of the peritoneum had not become impaired. In cases where ileus has existed for some time, primary resection is considered contraindicated, and is usually preceded by the establishment of an intestinal fistula for the purpose of overcoming the stenosis.

In every one of the 17 cases of carcinoma the disease had originated in the large intestine, the cæcum being the seat of the neoplasm in 53 per cent.

The ages of these patients ranged between thirty-two and sixty-five years; twelve were men; five women.

Eight, or 47 per cent. of the malignant cases, died as a result of the operation—5 of peritonitis, 1 of sepsis, and 1 of shock; 1 died five weeks after operation outside of the clinic; still another died of recurrence one year later. Three patients are reported well and, as far as can be ascertained, free from recurrence, three years after the operation. One case died eight years after operation—cause unknown; another is still living and free from recurrence, eight years since operation.

In the 9 cases in which resection was done for tubercular tumors, the caecum was found to be the main seat of the disease in all but 2; in the latter it was the ileum.

The ages of these patients ranged between twenty-three and fifty-seven years. Seven were women; 2 men.

The duration of the disease prior to the operation varied greatly. In one case it had existed for six years; in another four, and in a third three years. In the remaining cases it had lasted for shorter periods. With regard to hereditary taint the histories are rather inexact.

Of the 9 cases in whom resection was performed for tubercular tumors, 3 died, 1 of purulent peritonitis. The remaining 6 left the clinic cured, and 5 were traced. One of these is alive and well to-day, seven years after operation. Another had a recurrence in the stump of the colon three years later; 2 others are well two years after operation, and have gained considerably in weight. On the other hand, the result has been extremely unfavorable in one patient, in that the disease was noticed to rapidly progress before he had left the clinic.

Of the 3 patients operated upon for invagination, 2 were fourteen years old, the third was thirty years of age. Two recovered from the operation, 1 died of peritonitis. One of the patients is perfectly well to-day, four years after the operation. The other case could not be traced.

Resection was performed for the radical cure of intestinal fistula in 4, for stenosis and kinking in 2, and for artificial anus in 1 case. Four were cured, and 3 died, giving a mortality of 42.9 per cent.

Only 12 cases of resection for incarceration are reported, with 8 deaths and 4 cures. The small number of these cases, Fuchsig states, finds its explanation in the fact that they admit cases to the clinic only during the day, so that all night cases go to other hospitals.

Resection was invariably done on account of threatening or already present gangrene of the intestine. There were 8 crural herniæ, and all but 1 died. In 6 instances death was due to peritonitis.

From a table appended by Fuchsig, it appears that end-to-end anastomosis was done in 24; lateral implantation in 8, and lateral anastomosis in 16 cases.

Exclusion of the Intestine. Roskosechny's article¹ on the exclusion of intestine, comprising 34 cases done at the University clinic, Vienna, constitutes a very valuable contribution to the history of the subject. In 18 of the cases reported partial exclusion was done; in 16 total exclusion; 6, or 33 per cent., of the former, 1, or 6 per cent., of the latter died as a direct result of the operation. Of these, four who had

¹ Deutsch. Zeitschrift f. Chir., May, 1901, vol. lix.

been afflicted with bronchitis before operation, died of pneumonia resulting from protracted narcosis; the other 3 succumbed to perforative peritonitis. In 6 others death was due to causes not directly connected with the operation; in 2 of these partial, in 4 total exclusion had been performed.

As regards age, nearly all of the patients were young or middle-aged, only 2 being over fifty years.

With reference to sex, the cases were evenly divided.

Twelve of the partial, and twelve of the total exclusions were done for a diseased cæcum. The remaining cases represented inflammations, in which, owing to stenoses, resection was impossible.

In the total exclusions the ileum was excluded 16 times, the cæcum in 14 instances, the ascending colon 16 times, and the flexura linealis coli once.

The length of intestine excluded varied greatly. In 1 case over a yard was excluded; in another 160 cm. of ileum and 50 cm. of large intestine at one time.

Körte mentions a case in which 30 cm. and the colon up to sigmoid flexure was excluded in the course of eight different operations. This exclusion has so far been considered the longest; it is now surpassed by the foregoing.

In the partial exclusions the ileum and ascending colon were excluded 7 times; the ileum and transverse colon 6 times; double anastomoses were done between ileum on the one hand and ileum and transverse colon on the other; once anastomosis was established between transverse colon and flexure, and once between descending colon and rectum and ileum. The excluded portions in these cases were much shorter than in the total exclusions.

TECHNIQUE OF THE OPERATION. After opening the peritoneum by an incision, generally 10 to 14 cm. long, and determining the size, location, etc., of the tumor, anastomosis according to the usual methods was undertaken. In 24 of the 34 operations reported, anastomosis was accomplished through lateral apposition, with suture; in 8 with Murphy's button; in 2 lateral implantation of the ileum into the colon was done. Suture was employed in the majority of cases, because it is considered more reliable, the Murphy button giving good results only if all functional work is exact. In the 8 cases in which the Murphy button was used, shortening the narcosis as much as possible was essential, owing to the general condition of the patients.

Silk was used for suturing. A proximal and distal fistula was generally established in order to supply (nourish) the excluded portion. The central stump was sutured into the lower, the peripheral into the upper angle of the wound. This was done so that it might be pos-

sible to act upon the excluded portion in its entire length, by means of medicine, and to evacuate the secretions of this portion by irrigation, and thus to remove the original injurious foreign bodies, such as seeds, fecal stones, etc.

As regards the further fate of the patients, it may be mentioned that 3 of the 18 cases with partial exclusion are still living; 2 of these are feeling pretty well and are able to work; 1 is under treatment. Regarding 5 patients it has been impossible to learn anything during the last year or two. One case has returned to the clinic, the malignant neoplasm progressing rapidly. Two died at their homes six months after operation.

Of the total exclusions 7 are living, 4 being able to work, 3 under treatment; 4 could not be traced; 3 died six months to one year after operation.

"The Exclusion of Intestine as a Preliminary Operation to Extirpation of Large Cecal Tumors, with Remarks on Carcinoma of the Cecum," is the title of a paper recently published by Langemak¹ assistant to Graser (surgical clinic of Rostock). The author states that while exclusion of the intestine no longer can be classed among the rare operations, the number of cases in which the excluded intestine was later extirpated is, nevertheless, quite small. He succeeded in finding but 6 such cases in the literature, which he briefly reviews. In 5 of these extirpation was done in order to overcome disagreeable conditions resulting after exclusion, such as secretion of intestinal fluid, feces, etc. He has been unable, however, to find a single case in which extirpation of the tumor was pre-arranged to follow exclusion. He reports two such cases operated upon by Graser, which, although one of them succumbed to the second operation, nevertheless tend to prove the utility of the procedure. Special stress is laid upon the importance of definitely separating the abdominal from the wound cavity. If the condition of the patient is such as to render the speedy completion of the first operation absolutely essential, Langemak believes that the so-called incomplete exclusion (von Hacker's method) may have advantages over the complete exclusion, inasmuch as it will remove the stenosis, and thus give the patient an opportunity of recovering and gaining more strength for the second operation, that of extirpating the tumor.

If the patient's condition is relatively good, complete exclusion with suture of the two lumina is preferable. In that case it is unnecessary to open the free abdominal cavity at the second operation, and the extirpation may be accomplished quickly and without appreciable loss

¹ Deutsch. Zeitschrift f. Chir., January, 1902.

of blood, regardless of the place of anastomosis, especially as Hochenegg's experience has shown that the adhesions of a tumor disappear after exclusion of the intestine. Both methods have the advantage that extirpation may be done at any time deemed most suitable in view of the patient's condition, and that through this preliminary operation the removal of tumors that would otherwise be considered beyond resection still becomes possible.

There is, however, Langemak says, a method which will probably limit the indication for the just mentioned exclusion methods, and that is the most ingenious resection method originated and recently published by Mikulicz. The latter has employed it in 12 cases of malignant and tuberculous disease of the large intestine, and ileocaecal tumors. It consists in isolating the diseased portion of intestine together with the tumor and the two afferent shanks of intestine. The diseased mesenteric glands are dissected free sufficiently to allow the tumor to be easily placed outside of the abdominal wound in front of the abdominal wall, with closure of the abdominal wound as far as possible, and removal of the tumor a few days later. The resulting artificial anus is later closed directly or by means of first destroying the hippocampus minor and then closing the intestinal fistula. The advantages of this method are so evident, Langemak states, that it will no doubt be more frequently used in the future, especially when small or medium-sized tumors come into question.

Inasmuch as only one of the 12 cases died as a result of the after-operation, it is to be expected that the method will tend to reduce the mortality which is now placed at 39.5 per cent. for all intestinal resections taken together, and 49 per cent. for ileocaecal resections.

Exclusion of intestine, Langemak believes, will be done in the cases in which dissection from its base is too difficult or where the tumor is too extensive. He believes, however, that tumors that are on the boundary line of operability, or did not seem amenable to radical extirpation before operation, may yet become operable after entero-anastomosis with exclusion of intestine.

With regard to the *relative frequency of carcinoma of the caecum* as compared to carcinoma of the intestine in general, Langemak submits the following figures :

A. Zemann found 12 cases (7.02 per cent.) of cancer of the caecum in 165 cases of intestinal cancer.

Maydl reported 9 cases of cancer of the caecum in 100 cases of intestinal cancer, or 9 per cent.

Nothnagel reported 14 tumors of the caecum in a series of 243 cases of cancer of the intestine, 5.07 per cent.

Leichtenstern found the cæcum the seat of disease in 32 of 770 cases of cancer of the intestine, being 4.1 per cent.

Rupp gave a proportion of 7 to 99, 7.07 per cent. of cancer of the cæcum.

Klein found the cæcum and ascending colon diseased in 12 of 118 cases of cancer of the intestine, 10.1 per cent.

Colloid carcinoma, which shows a proportion of 1:30 to all other varieties of carcinoma, was found but once in the cæcum in a series of 38 colloid carcinomata of all organs of the abdominal cavity, and 14 times in the intestine, according to Klein's dissertation.

Langemak, therefore, believes with Klein that the views of earlier observers who held the intestinal tract to be the favorite seat of colloid carcinoma are based on error, and that colloid carcinomata occur in all organs that are subject to the disease, and prefer the intestinal tract only in so far as the latter represents a favorite seat for all carcinomata. This latter statement is supported, he adds, by the statistics of Tauchons, who, on basis of material covering 9000 cases, found the proportion of intestinal cancer to all others to be like 1 to 25.

The Treatment of Fecal Fistula or Artificial Anus, especially with reference to its cure by enterectomy, is a subject that is receiving more and more attention from surgical writers.

Delore and Patel,¹ of Lyon, have contributed a valuable paper upon this subject. The different varieties of artificial anus with and without spurs are well shown by the accompanying illustrations (Figs. 20 to 24). Numerous operative procedures have been devised for the cure of this lesion. Many cases of artificial anus undergo spontaneous cure. Foucher (Thesis, Paris, 1857) reported that Delplanque had seen 56 spontaneous cures in 121 patients, being 46 per cent., but he himself did not place much reliance upon these statistics. Goetz, in his important work (Thesis, Genève, 1890) found only 11.63 per cent. of cures in 215 cases that he was able to collect. Among the conditions favorable to spontaneous cure, Goetz mentions:

1. Absence of a spur.
2. Small intestinal and skin orifices.
3. Passage lined with a granulating membrane.

Among the unfavorable conditions he mentions:

1. Bleeding spur.
2. Large cutaneous and intestinal orifices.
3. Passage lined by the mucous membrane of intestine.

The indications for surgical treatment have become clearer since the introduction of aseptic methods and greater perfection in operative technique.

¹ *Revue de Chir.*, 1901, Nos. 5 and 6.

FIG. 20.

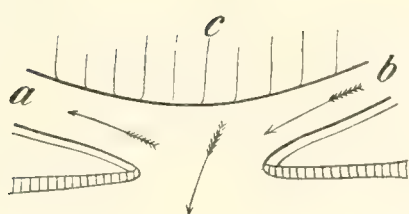


FIG. 21.

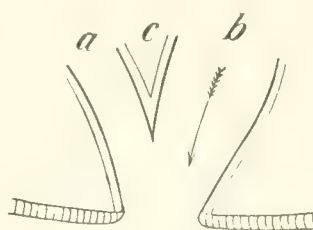


FIG. 22.

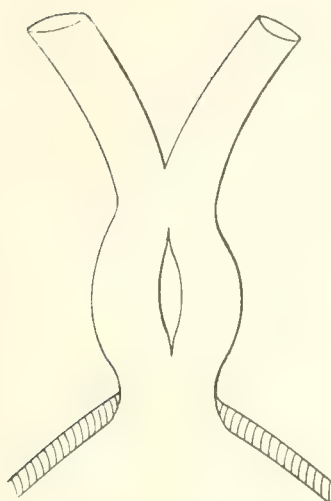


FIG. 23.

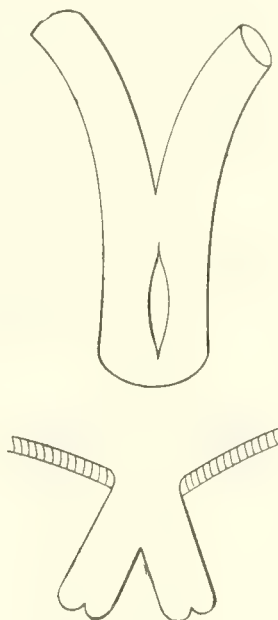
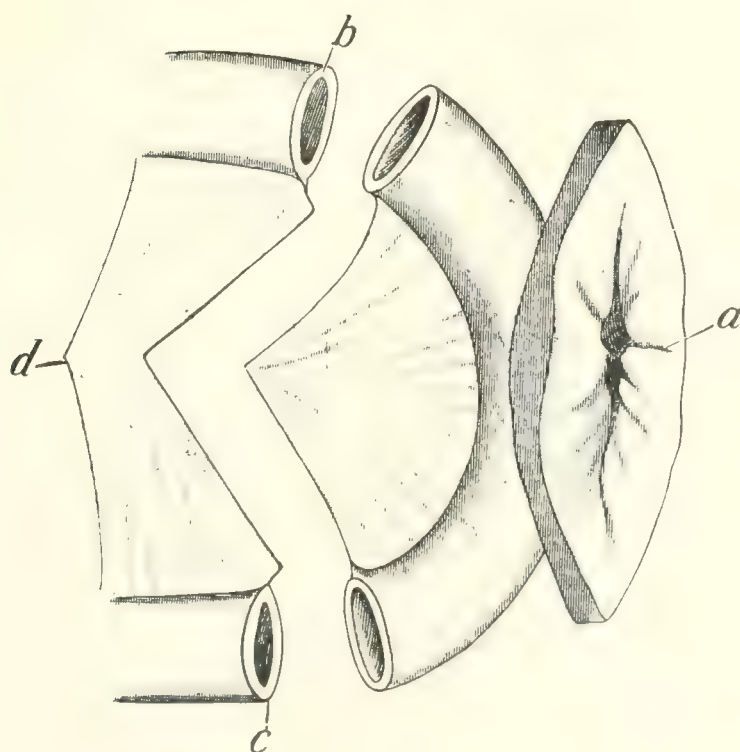


FIG. 24.



In 1883, Pollosson advised operating for this condition if the fistula was in the small intestine, on account of the rapid emaciation which, as a rule, accompanies this trouble. He advised delaying the operation for two months if the general condition could be maintained for this length of time. The present feeling is rather in favor of earlier operation.

The earlier methods of operation were mostly extraperitoneal. It is unnecessary here to describe in detail the various ingenious devices employed during the past century to re-establish the intestinal flow. Dissection of the spur was practised in Germany for the first time in 1798 by Schmalalden, and repeated by Physick in 1809. In 1813, Dupuytren, ignorant of these cases, placed a suture at the base of the spur, but the result was unsatisfactory and the spur was then incised with scissors, which gave rise to peritonitis.

Later on various attempts were made to cure the lesion by means of occlusion of the artificial anus by different devices; among these the most important to be mentioned are compression by means of compresses of gauze or plaques of gutta-percha, and cauterization.

The results of these extraperitoneal methods were decidedly discouraging. In 1839 Dupuytren reported three deaths in 41 cases, or 7.32 per cent. Goetz, in 1890, found 4 deaths in 113 cases, or 3.54 per cent.

As regards the result of operations, Goetz's statistics show 29 per cent. of successes; 69 per cent. of failures. Such were the results from enterotomy alone.

While the mortality was low, the results were far from satisfactory, and, when one considers the long and tedious treatment necessary to obtain a small proportion of successes, there is little wonder that bolder surgeons were tempted to try intraperitoneal methods.

Polano, in 1853,¹ opened the peritoneal cavity for artificial anus and obtained a complete cure. His example, however, was not followed for a long time, and it was only in 1876 that Czerny under anti-septic principles performed a similar operation. He had two successes.

Though the intraperitoneal method was admitted to be very rational, nevertheless it was not practised exclusively, and the extraperitoneal method received a great deal of attention.

In regard to the choice of procedure in intraperitoneal operations, Delore and Patel state that there are three methods at the disposal of the surgeon:

1. Lateral enterorrhaphy. This procedure consists in freeing the intestinal coil completely from the inside of the peritoneal cavity and closing the orifice by sutures, either transversely or longitudinally.

¹ Centralblatt f. Chirurgie, 1877, p. 545.

In 1894, Senn advised enterorrhaphy, and in 1896, Le Dentu¹ collected 11 new cases of lateral enterorrhaphy, all of which were successful.

2. The second method is entero-anastomosis. The same consists in establishing a lateral communication between the two intestinal coils (false anus) and leaving intact the diseased portion. This operation was employed successively by Laugier, Comte, Terrillon, Chaput, and others. The chief point in favor of the operation is its freedom from risk; yet, when one considers the fact that it does not effect a complete cure, but only alleviates the condition, it cannot be considered a method of choice.

3. The third method is that of enterectomy with removal of the diseased portion of the bowel and occlusion of the orifice. This is the ideal operation, inasmuch as it not only re-establishes the natural currents of the bowel, but leaves no disagreeable condition behind.

Dupuytren is supposed to have first conceived the idea. In the same year Roux² performed a similar operation, but the patient died thirty-six hours after of peritonitis.

In Germany, Huter, and later Schede, Dittel, Billroth, and Madelung, advocated enterorrhaphy. In 1889, Goetz collected 77 circular enterorrhaphies, with 32.47 per cent. of deaths. As late as 1890, Chaput³ condemned enterectomy and advised entero-anastomosis. Later Le Dentu expressed the same opinion.

The high mortality of enterectomy does not compare favorably with the lower mortality of enterotomy, but when we consider that less than one-fourth of the cases were cured by enterotomy, and the condition of many of the others that were not cured was probably little better than death, the advantages of enterotomy are more apparent than real. Delore and Patel state that if the statistics of individual operators of well-known ability are considered, the mortality becomes much reduced. For example, Schede had 4 cases, with 3 cures; Julliard 6 cases, with 6 cures; Billroth 14 cases, with 14 cures; Doyen 3 cases, with 2 cures; Pollosson 6 cases, with 5 cures; that is to say, 32 cases with only 3 deaths, or a mortality of 9 per cent.

Delore and Patel report in detail 2 cases observed at the clinic of Professor Poncet, in which gastrectomy was performed for this condition with the aid of the Murphy button. The first case was operated upon on June 17, 1899. The patient made a rapid recovery, and the button was expelled on July 16th, one month later. In the second case, operation was performed on February 26, 1901, and the button

¹ *Revue de Chir.*, 1896.

² *Archiv gén. de Méd.*, 1828.

³ *Arch. gén. de Méd.*, 1890.

expelled seventeen days after operation. Delore and Patel give in tabular form 23 cases of enterectomy, of recent years, with only 3 deaths, or a mortality of 12 per cent. In 9 of these cases the Murphy button was employed, with only 1 death.

Three and a half years ago I operated upon a boy, aged fourteen years, for fecal fistula of the small intestine of three and one-half years' duration. Several attempts had been made by another surgeon to close the opening in the bowel by extraperitoneal methods, without success. A large part of the fecal matter came through the false anus, so much that the boy was greatly emaciated and his condition pitiable. I resected six inches of the small intestine and united the ends by means of a Murphy button. The patient made an excellent recovery and left the hospital at the end of three weeks. Up to this time the button had not been seen, and it was not positively known that it was passed later. The patient gained twenty-eight pounds in six weeks, and has been in perfect health ever since, more than three years.

Delore and Patel discuss at considerable length the advantages and disadvantages of Murphy's button, and are themselves ardent advocates of this aid in enterectomy. They report 13 personal cases of resection of the bowel for strangulated hernia, in which the button was employed, with only one death.

Their conclusions are that extraperitoneal methods in the treatment of artificial anus should be employed only in exceptional cases, and that the intraperitoneal methods at the present time are attended with but little risk and make it possible to obtain a complete cure. Entero-anastomosis seems to be of little value. One is always able to perform an enterectomy or unilateral exclusion. Lateral enterorrhaphy may be reserved for cases where the artificial anus is situated in the large intestine, but this method should not be employed for the small intestine.

Enterectomy is the method of choice, as the lesion is entirely cured by this method. The uniting of the two ends by means of circular enterorrhaphy at the present time should be the exception, and Murphy's button which has incontestable advantages, should be more and more used.

I believe that these conclusions are thoroughly justified by a careful survey of the cases thus far reported. I would even advise the Murphy button in many cases of resection of the large intestine, although most surgeons think that it is contraindicated in such cases.

I have recently assisted Dr. W. A. Downs, my colleague at the General Memorial Hospital, in operating upon a fecal fistula of the descending colon of three-years' standing, with very dense adhesions. About three inches of the bowel were removed and the ends united by

means of the Murphy button. The patient has made a very good recovery.

Clairmont¹ reports a series of 29 operations for the radical cure of fecal fistula or artificial anus as carried out in the Königsberg clinic. The operation was usually done in one of two ways: A circular incision was made around the fistula opening into the peritoneal cavity; the portion of intestine involved was exposed and so much of its wall resected as was necessary to remove the fistula; this was followed by suture of the wound in the intestine, and then by suture of the wound in the abdomen. This method was followed nine times. The other method of treatment was a linear incision into the peritoneum, isolation of the affected loop of gut, excision of the affected portion of its wall, suture of the intestinal and then of the abdominal wounds. The fistula thus severed from the intestinal tract remained to be treated by excision, or removal of its mucous membrane, or eversion, or simple curettage and drainage. Either of these two methods, Clairmont thinks, has its advantages, and it is not possible to say of either that it is the better one. The circular incision around the fistula enables the operator to meet adhesions in its vicinity more readily; but it may fail to give him a sufficiently wide view of the parts away from the fistula, and thus may hamper him in the removal of the affected portion. If the second method is chosen, the treatment of the external fistula presents no especial difficulty. Even if it cannot be removed, the discharge becomes insignificant as soon as the fistula is cut off from the intestinal canal, and without eversion or removal of the mucous membrane the rapid shrinkage of the parts which follows cauterization with silver nitrate or simple gauze drainage may lead to a speedy cure. Personally I believe enterectomy with a Murphy button the best operation.

Diverticula in the Sigmoid Flexure of the Colon. K. Sudsuki² endeavors to answer the question as to the manner in which diverticula in the sigmoid flexure are formed, the causes of their formation, and as to the changes they produce in their surroundings.

He has taken such intestinal sections for examination in which congestion was present, or adhesions with the surroundings were found, or where the formation of a diverticulum could be noticed macroscopically. His observations include 40 cases, as follows:

28 cases with congestion	6 diverticula.
12 cases without congestion	9 "
13 cases with adhesions	5 "
27 cases without adhesions	10 "

¹ Arch. f. klin. Chir., 1901, vol. lxiii. p. 670.

² Ibid., 1900, vol. lxi., No. 3.

Thus a diverticulum was found 15 times in 40 cases. With few exceptions they were found in the sigmoid flexure of the colon, and in the majority of cases belonged to the so-called false diverticula. However, in 6 instances he found in addition to the latter a true diverticulum.

As regards the origin of the false diverticulum, observation has shown that they are caused by a protrusion of the mucous and submucous membranes through the interstices of the vessels, where they are found surrounded by loose connective tissue or fat.

Congestion, he states, does not come into consideration as a causative factor. This is proven by the fact that in the cases examined a diverticulum was more frequently found in intestines without than with congestion. Special pressure is required for the formation of a diverticulum, and this may be due to congested feces or gases. Here, however, the action of the musculature must be also considered. In trying to remove the obstacles presenting themselves, this action becomes most pronounced in the direction of least resistance—*i. e.*, in the direction of the interstices of the vessels.

Thus, Sudsuki states there are three factors of importance active in the formation of a diverticulum: 1, little power of resistance of the loose connective tissue and presence of fatty tissue in the interstices of the vessels; 2, pressure due to the feces or gas; 3, muscular action.

As to the true diverticulum, it is clear that here, as well as in the false, pressure by means of feces or gas is required. He believes, however, that the muscular action also has some influence upon the formation of a true diverticulum.

With regard to the changes in the surrounding region of the diverticulum, Sudsuki found adhesions in 5 out of the 15 cases. Microscopical examination showed slight infiltration with leucocytes, especially in the connective and fatty tissue around the diverticulum, occasionally also in the serous membrane. These inflammatory signs, he thinks, are due to the diverticulum. It must be remembered, however, that similar infiltrations are frequently met with in intestines with adhesions, but without diverticula. He never observed perforation of the diverticulum in his cases, but states that this does not disprove the occurrence of perforation.

The Use of the Murphy Button. The question of the relative advantages or disadvantages of the various forms of mechanical contrivances as compared with simple suture in intestinal approximation is still unsettled. This problem has been recently discussed by Jacob Frank,¹ of Chicago. He believes that the revival of mechanical con-

¹ *Annals of Surgery*, January, 1902, p. 36.

trivances for intestinal surgery is largely due to the work of Senn in 1887, and holds that the introduction of Murphy's button for intestinal operations has been an important factor in reducing the mortality in this field. Frank states, "granting that bad results occasionally do occur, for which the button is directly responsible, do we not and did we not formerly get a much larger percentage of unfavorable results, both immediate and remote, in restoring the continuity of the bowel?" Among the accidents more likely to occur after suture methods than where the button is used, he mentions sinuses at the point of approximation as a result of cicatricial contraction; secondly, shock due to prolonged handling and exposure; thirdly, leakage from the points of exit and entrance of the needle. "Why, then," he says, "is this cry of opposition against the use of mechanical methods, in spite of results which were never achieved before their use." He calls attention to the fact that the very men who advocate the suture methods and who place little importance upon the saving of time in these operations, themselves use the button in emergency cases that are almost moribund and in which time-saving is a great factor. As an evidence that the Murphy button is growing in popularity, Frank states that although four years ago von Bergmann, Gussenbauer and Wölfler condemned the button, a year ago they were all unanimously in favor of it, especially in end-to-end union. von Bergmann has stated that for the past three years he has discarded all suture methods, not excepting his own end-to-end approximation, and that he now uses Frank's modification of the Murphy button, with splendid results.

Czerny, of Heidelberg, has been using the button since 1896 in his intestinal work, and has had a very low mortality.

The essential requisites in performing successful intestinal approximation, Frank classifies as follows:

1. Simplicity of application.
 2. Time-saving.
 3. Uniform coaptation of peritoneal surfaces.
 4. Arresting hemorrhage at the point of approximation.
 5. A cicatrix that will not contract to a deleterious degree.
 6. To obtain as nearly as possible histological structures in exact juxtaposition.
 7. The avoidance of infection.
 8. The least disturbance in continuous peristaltic wave at the point of union.
 9. Avoidance of packing and shelving.
 10. Reduction of mortality.
 11. Leaving a minimum number of lesions.
- Most of Frank's points seem well taken, and the growing popularity

of the Murphy button seems to rest largely on its merits. The case of double resection for carcinoma of the cæcum in which I used it personally is convincing evidence of its great value.

Malignant Tumors of the Rectum. A very careful report as to the results at Albert's clinic of radical treatment of malignant tumors of the rectum is given by Hans Lorenz.¹ The material which forms the basis of his statistics comprises 331 cases treated at the clinic since the introduction of Kraske's method, January 1, 1887, up to February 15, 1901. Radical operation was done in 158 cases. In addition to this colostomy was performed in 105 patients with carcinoma, and 68 were dismissed from the hospital without operation. His statistics cover the largest number of cases ever reported as being observed at one clinic.

Radical operation was done 91 times in men and 67 times in women; while colostomy was performed 89 times in men and 26 times in women.

As regards preliminary operation, the dorsal method with continuous resection of sacrum and coccyx, or with removal of the coccyx only, was the sovereign method. While during the first seven years, from 1887 to 1893, the peritoneal method was still employed in 13 instances, it was done but three times since that time. Two beautiful results were achieved through operation by the vaginal route.

Enucleation of the coccyx, with or without removal of the sacral parts, was done 133 times for the removal of malignant tumors of the rectum; in 128 of these cases the operation was done for primary carcinoma.

In the great majority of cases the disease occurred between the ages of forty and sixty years. The youngest man was twenty-two years, the youngest woman was twenty years, the oldest man was seventy-two years, and the oldest woman was seventy-eight years of age.

In 42 instances enucleation of the coccyx only was sufficient, while in 91 parts of the sacrum also had to be removed.

Of the 133 cases of radical operation, 17 died in consequence of the intervention, giving a mortality of not quite 13 per cent.; deducting the deaths that resulted from other causes than wound infection—as is done by some authors—the mortality would be only 9 per cent.

Amputation of the rectum was done in 90 cases, with 13 deaths, 8 of which were due to wound infection. Resection was done 25 times, with 3 deaths, all due to wound infection. The "*Durchzieh methode*" (the method of pulling the upper end of the intestine through the anal portion, suturing it to the outer skin, the mucous membrane of the anal

¹ *Archiv. f. klin. Chir.*, 1901, vol. lxxiii., No. 4.

portion having previously been removed) was practised in 17 cases with one death due to wound infection.

These figures show wound infection to have been the cause of death in 9 per cent. of the amputations, in 12 per cent. of the resections, and in 6 per cent. of the cases where the "Durchzieh methode" was used.

Lorenz states that better functional results are to be expected from the latter method than after resection, as is confirmed by the figures given :

Eighteen of the nineteen cases treated by the "Durchzieh methode" survived the operation, and in 8, or 47 per cent., absolute continence resulted ; in 5, or 29 per cent., partial continence, and in 4, incontinence.

In 8, or 36 per cent. of the 22 cases surviving resection, absolute continence was obtained ; in 6, or 27 per cent., partial continence, and in 8, or 36 per cent., incontinence. In other words, complete success and complete failure resulted equally often in the cases treated by resection.

Taking the 39 cases in which the treatment was such as to have made continence not impossible, we find complete success in 16, or 41 per cent. ; partial success in 11, or 28 per cent., and total failure in 12, or 31 per cent.

With reference to permanent results, Lorenz states that in all 103 patients were operated upon more than three years ago ; of these 100 were cases of cancer of the rectum. Despite the most conscientious researches made, no trace whatever could be found of 11.

The following table shows the results in the 100 cases that come into question :

Deaths due to operation	11
" " intercurrent disease in the third year after operation	1
" " recurrence within first two years	30
" " " " third year	9
" " " " fourth year	5
" " " " seventh year	2
" " osteosarcoma of left thigh	1
Cases not traceable	11
Cases with recurrence observed from five months to two and a quarter years, but since lost track of	6
Living to-day, four and three-quarter years after operation, with recurrence	1
Cases free from recurrence from five months to three and a half years after operation, but since lost trace of	7
Deaths due to intercurrent disease from three and a half years to six and five-sixths years after operation	3
Patients living to-day, from three and a half to thirteen and three years after operation, free from recurrence	13

Computing the mortality percentage on the basis of these 100 cases, without any exclusions, though only 11 died in direct consequence of the operation, Lorenz states, we have 16 per cent. of permanent cures.

Operation for Malignant Disease of the Rectum. In the April number of the *Deutsche Zeitschrift für Chirurgie*, 1901, Payr publishes an article entitled "Contribution to the Technique of Some Operations upon the Large Intestine." The object of his paper, he says, is not to establish any "new methods," but merely to demonstrate what has been found efficient in the hands of various operators.

After referring to the methods employed by Kraske, Hochenegg, and others in the treatment of the central intestine after resection or amputation of the rectum, he describes Nicoladoni's¹ procedure of pulling the proximal stump of the rectum through the anus, preventing it from slipping back by a ring 3 to 4 cm. wide. This ring is made of silver wire covered with iodoform gauze; the end of the intestine is fastened to this ring by continuous suture. From the distal end of the intestine the mucous membrane is removed; thus broad surfaces favorable for healing are brought into contact.

A few internal sutures are used to fasten the stump of the large intestine that has been pulled through to the proximal portion of the rectum that has been left. Saline aperients should be given instead of opium, as formerly used.

The advantages of this method are: greater speed, simplicity, and cleanliness have been noted, Payr says, not only at the Graz clinic, but also by others.

Sieber,² in an inaugural dissertation, reports 33 cases thus operated upon at Mikulicz's clinic, and Henle, at the Surgical Congress, two years ago, emphasized the great improvement in the results of sacral operations upon the rectum since Nicoladoni's method has come into use.

Wound infection as well as peritoneal infection is avoided by the same; evacuation of feces is made possible at an early date; convalescence is promoted not only on account of the improved conditions for wound healing, but also on account of the greatly diminished necessity for after-operations.

Kümmel, too, has employed the method in his operations upon the rectum.

Instead of the silver wire ring, Payr used a large Murphy button, especially constructed for the purpose. He inserts it in the following manner:

¹ Centralblatt f. Chir., 1897, No. 35.

² Inaug. Dissert., Breslau, 1900.

After the proximal portion of intestine is drawn through the anus, the button is placed so that its male part may be pushed into the opening of the central end of the gut, which is armed with the usual tobacco-pouch suture. The female part of the button is then pushed over and the two halves of the button are slightly pressed together. Within the male half of the button is a thick rubber drain well covered with vaseline and filling up completely the lumen of the button, thus rendering the latter water-tight.

The drain is about ten inches long and ends in a receptacle outside the dressing. The size of the button prevents the slipping back of the intestine.

The superiority of this method consists of the fact that infection—even of the dressing by thin stool—can be positively avoided, inasmuch as feces, as well as gases, are made to pass outside. Irrigation may be done without necessitating change of dressing.

If the two halves of the button fit only moderately well the button will last seven to eight days, at which time the danger of infection for the sacral wound as also for the peritoneum has dwindled to a minimum.

Payr states that he has had occasion so far to use the button in three instances, and twice it has been employed at the clinic at Graz, and in every case the result has been satisfactory.

Payr states that such buttons may also be used to advantage in colostomy or in colotomy, serving as a palliative measure. Here, too, the prevention of infection to the peritoneum and the abdominal wall and great cleanliness are of great moment.

He further declares that the procedure is well adapted for use in such methods of intestinal fistula formation as have for their object the establishment of an organic closure of the artificial anus, as for example in Gersuny's method of twisting, von Hacker's and Witzel's methods, etc.

In cases where speed is an essential factor in the performance of colostomy for intestinal obstruction these buttons are of great value on account of the speed and simplicity with which they may be adjusted.

After Krönlein's extensive statistics on the subject of carcinoma of the rectum, read before the last Surgical Congress at Berlin, 1900, and including the operations done at eleven different German clinics, Vogel, in the April, 1901, issue of the *Deutsche Zeitschrift für Chirurgie*, publishes a further list of operations performed at the surgical clinic and St. John's Hospital at Bonn (Prof. Schede) between October 1, 1895, and January 1, 1901.

The report comprises 61 cases, in 48, or 78.7 per cent., of which radical operation was performed, while the remaining 13, or 21.3 per cent., received palliative treatment.

For comparison of figures, Vogel cites the following :

	Per cent.
Heidelberg clinic, radical operations	71.5
Zürich (Stierlin) " "	50
" (Christen) " "	55.8
Göttingen " "	78.3
Marburg " "	75.4
Breslau " "	60.6
Freiburg " "	73
Rostok " "	47.2
Greifswald " "	48
v. Bergmann's clinic " "	80

Of the 61 cases reported by Vogel, 35, or 57.37 per cent., were men ; 26, or 42.63 per cent., were women, being a proportion of 1.35, or 1 per cent. The ages of the men ranged between forty-three and seventy-five years, the average age being 59.5 years.

Between 40 and 50	5
" 50 " 60	11
" 60 " 70	15
Over 70	4

The ages of the women ranged between twenty-four and seventy-two years, the average age being 50.15 years.

Between 20 and 30	2
" 30 " 40	3
" 40 " 50	8
" 50 " 60	8
" 60 " 70	1
Over 70	4

Taking the combined ages of the men and women, we receive an average of 55.5 years.

Twenty-five of the male cases were operable, and the average age of these was 59.24 years ; that of the inoperable cases 60.1 years.

Of the female cases, 23, or 88.46 per cent., were operable, with an average age of 51.27 years for the operable, of 40.66 years for the inoperable. The average age of all the operable cases combined was 55.47 years ; that of the inoperable cases 55.61 years.

Vogel calls attention to the great difference in many respects between the sexes ; the youngest male case was forty-three years old, while the youngest female case was only twenty-four years old. The majority of the male patients were between sixty and seventy years of age, the female between forty and fifty years, showing a difference of twenty years. The average age of the men is nearly ten years above that of the women.

A very remarkable feature is that the average age of the operable was eleven years above that of the inoperable women, which again shows that cancer is far more malignant in the young than in the aged.

As regards etiology, the histories of the cases are almost entirely negative. A history of heredity was given in but one instance; chronic constipation in three; hemorrhoids in two. The inguinal glands were affected in but one instance, so that the view expressed by Winiwarter that the inguinal glands are generally—in most cases even primarily—affected is not shared at Schede's clinics.

As regards indication, it may be said that it was only inoperable metastases, adhesions involving vital organs, and exceedingly poor, general health that furnished a contraindication to operation, never the seat or extent of the tumor.

With reference to choice of operation, Vogel states this depends entirely upon the nature of the individual case. He does not agree with Hochenegg, who considers the sacral method the normal operation. In addition to the seat and size of the tumor, the sex of the patient comes into consideration when deciding upon the method to be employed. The perineal method was employed 31 times in 26 patients—8 men and 18 women.

One of the most important procedures preparatory to extirpation of carcinoma of the rectum is the establishment of an artificial anus in the descending colon in the linea alba lateralis sinistra. This operation forms a routine measure in all sacral extirpations; in the 31 perineal operations it preceded extirpation in 8 instances. Anterior and posterior raphe incision, with circumcision of the sphincter, was done 8 times; Rehn's operation, with splitting of the vagina, was performed 11 times, and Schuchardt's incision 5 times.

With regard to the immediate result of the perineal operations, there were in all 7 deaths in 31 operations that were attributable to the intervention, or a mortality of 22.58 per cent. Recurrence was observed 10 times, or 32.26 per cent., after an average duration of ten months. The remaining patients are free from recurrence, namely:

Four and a half years after operation	1
Over three years after operation	2
One year and four months after second operation	1
From one to two years after operation	6

In the other four operation was performed very recently.

		Per cent.
Normal continence resulted in	3 cases, or	15
Nearly normal continence resulted in	5 " or	25
For hard stool only	9 " or	45
No continence	3 " or	15

The sacral method—always preceded by Rydygier's operation—was employed in 22 cases, 17 men and 5 women, with 10 deaths, or a mortality of 45.45 per cent.

Of the 12 cases that survived operation, 3, or 25 per cent., died of recurrence or metastases, on an average of 14.5 months after operation. The remaining 9 are still alive and free from recurrence :

From three to four years after operation	.	.	.	.	.	3
“ two “ “ “ “	.	.	.	.	.	2
“ three to ten months “ “	.	.	.	.	.	4

As regards the function of the rectum, 6 of 12 cases that survived operation still have or had when they died the artificial anus ; one is under treatment. All others have normal continence. Inasmuch as the foregoing 6 do not yet come into consideration, the cases operated upon by the sacral method show normal continence in 100 per cent.

Regarding the combined results of both methods employed, we find that in a series of 53 operations there were 17 deaths, or a mortality of 32 per cent.

In the cases that survived operation and after-treatment, 32 in number, recurrence was noticed in 13, or 36 per cent., on an average of 11.27 months later.

Of the remaining patients 6 are alive and free from recurrence (16.7 per cent.), three years and upwards ; 8, or 22 per cent., upward of two years.

The functional result was satisfactory in 52 per cent. of the cases.

In 10 of the 13 inoperable cases colostomy was done, but always, with the exception of but 1 case, in the descending colon. In this patient the tumor was situated high up and had attacked the flexure, for which reason colostomy was performed on the right side. This was the only case that did not survive operation.

GYNECOLOGY.

By JOHN G. CLARK, M.D.

DURING the last year many contributions to the literature of gynecology have been made, and some of them are of great practical importance.

Many articles, as will appear in the succeeding review, are of practical value and will be of considerable assistance in the treatment and care of patients, and have, therefore, been rather fully reviewed for PROGRESSIVE MEDICINE.

Several articles have appeared relative to cancer of the uterus and to treatment of pelvic inflammatory diseases of the uterus and appendages, without, however, bringing us much nearer to a uniform consensus of opinion upon these topics.

Relative to cancer of the uterus, only here and there contributions have appeared which go to the building up of our knowledge of this subject. Nothing further has been added to the meagre proof as to the parasitic theory, and treatment continues to be painfully deficient. The one subject which has been especially emphasized in all of the recent papers relative to the treatment of cancer is the necessity of an early recognition of the disease. All writers dwell upon the dangers of delay in cases of atypical uterine bleeding in women about the menopause. It is gratifying to know that physicians in general are giving up the antiquated idea that atypical bleeding about the climacterium is a sign of the approaching cessation of the menses. The menses rarely ever terminate in this way, and therefore, for the patient's sake, all excesses in the way of periodic or irregular uterine bleeding in women after thirty-nine years of age should be looked upon with grave suspicion and considered of malignant origin until proved to be benign in type. By heeding promptly this danger sign cases will be saved by early operation from the fearful suffering and death from cancer.

The treatment of pelvic inflammatory diseases has been considered in several good papers from the stand-point of the operator's experience, and I believe these careful observers are crystallizing more and more into definite and uniform methods the treatment of these cases, although medical societies from the East to the West have witnessed most spirited controversial discussions upon this subject during the last year.

Among the new text-books of value that have appeared during the last year, Montgomery's *Text-book of Gynecology* is entitled to a first place. As a result of the author's years of careful work in practical gynecology, he is entitled to judge of what best to put before the student in gynecology. He has considered all of the chief methods of treatment, and has then designated that which he himself follows. In this way we are given a very good general view of the subject. One must be especially impressed with the illustrations, the majority of which serve admirably the purpose of elucidating all difficulties which the text may not bring out clearly. This book is a valuable one, and should be in the library of every physician who has to deal with gynecological patients.

TREATMENT OF PURULENT COLLECTIONS IN THE PELVIS.

During the last ten years the treatment of pelvic inflammatory lesions has undergone change after change; theories have been strengthened or discredited, some methods have been perfected and their indications well defined, while others have been quickly discarded. Mandl and Bürger,¹ assistants in Schauta's clinic in Vienna, have quite recently reviewed this subject in a most exhaustive way, and while I may not be in full accord with all of their conclusions, as my comments later will indicate, nevertheless, they have unquestionably treated the subject in a most effective way both from the practical and historical standpoints.

As a preliminary statement which is in accord with the principles held by many of the leading surgeons of the day, although refuted by some others, they say that while in the larger proportion of cases sooner or later operative intervention of some kind is necessary in purulent inflammation of the pelvis, they nevertheless try first in properly selected cases the curative effects of absolute rest in bed, baths, hot douches, poultices, etc. The patient may be kept for weeks under this treatment before operation is finally deemed unavoidable.

This conservative tendency is commendable, and without doubt when it is faithfully carried out, with full attention to all points in treatment, a definite proportion of cases may be carried through their attack without resort to operation. In fact, I am so convinced of this point that my inclination is to observe a tentative policy in many inflammatory cases which come under my care. If the case hangs, as it were, in the balance, neither improving nor showing retrogressive symptoms, opera-

¹ Beiträge zur operativen Behandlung von Eiteransammlungen in der Anhängen der Gebärmutter, Archiv f. Gynäk., Band lxxiv., Heft 2.

tion is indicated. Again, when the tendency is from bad to worse, I at once abandon all non-operative conservative means and at once resort to operation. It must be remembered that, in comparison, acute inflammatory infections of the ovaries and tubes are much less dangerous than in other abdominal organs, especially the vermiform appendix, and therefore the patient's life or health is not greatly jeopardized by the less radical policy.

While there are conservative methods which may not be dangerous, others which have as their object the emptying of pelvic abscesses through the uterus by massage or by curettage of the uterus are to be unqualifiedly condemned.

Thus Ziegenspeck and Küstner have advocated even in recent years massage in cases of sacosalpinx; Doleris the puncture of the abscess sac through the uterine cavity; and Pozzi the deep curettage of the uterus, with a view to assisting the evacuation of pus.

As our knowledge of these cases go at present such methods are only mentioned to be condemned. The two authors above mentioned, whose work I propose to review, have studied all of Schauta's cases—273 in all—operated upon between the years 1888 and 1900.

The various operations performed in these cases were :

1. The removal of the suppurating appendages by cœliotomy.
2. The removal of both appendages and the uterus by cœliotomy.
3. The incision and emptying of one or both tubes through abdominal incision.
4. The extirpation of both appendages and the uterus per vaginam.
5. The removal of only one ovary and tube per vaginam, leaving the uterus and adnexa *in situ*.
6. The opening and evacuation of the abscess per vaginam.

Salpingo-oophorectomy Abdominalis. In view of the importance of this subject I shall detail *in extenso* the historical review, for it is both interesting and instructive, giving, as it does, the reasons why certain modifications in treatment have been instituted.

Hegar, in 1877, was the first to remove both ovaries and tubes for double pyosalpinx. This novel procedure was instituted at a time when puncture and incision of the abscess sac was the only surgical treatment in vogue. As the principles of antiseptic surgery were then being advocated and put into effect with satisfactory results in other fields of abdominal surgery, Hegar began to perform salpingo-oöphorectomy for pyosalpinx. The simple evacuation of the abscess through puncture or incision had not given satisfactory results in many ways. From an observation of these cases from our present view-point it would appear that one of the chief causes of failure was insufficient evacuation of the pus.

Fistulae remaining between the various viscera, such as the bladder and intestine, the recurrence of the abscess, the chronicity of the suppurative process through ineffectual drainage—all seemed to be additional objections pointing to the necessity for the more radical removal of the pus sacs.

At this point a digression is necessary to explain the tendency shown by some operators of the present day to return to these apparently more primitive methods.

We must remember that in those days many cases died before even the puncture or incision of the abscess was made, and in all cases this method was only employed as a desperate resort. The disease, in other words, forced the performance of an operation instead of the surgeon selecting appropriate cases, as is in his power at the present day.

From this brief comparison of the great difference in the condition of the patient as operated upon then and that of the carefully selected cases in which this measure is elected to-day it will be seen that objections which were then patent do not obtain at this time. In other words, vaginal section or incision in properly selected cases is an operation *par excellence*. These remarks are made in passing, for I shall take issue with Mandl and Bürger when their conclusions on vaginal section are reviewed.

As a result of the enthusiastic acceptance of Hegar's operation by such men as Zweifel, Chrobak, Säger, Olshausen, Martin, and others, the abdominal incision and extirpation of suppurating ovaries and tubes became the method of election.

Objections to this operation, however, became evident after its more extensive trial, such as the rupture of the pus sac and escape of pus into the peritoneal cavity, followed by peritonitis, the ensuing sterility, and the frequency of post-operative ventral herniæ.

A danger then greatly overrated was the escape of pus into the peritoneal cavity—overrated, for all pus was then assumed to be virulent, an assumption which later bacteriological studies have proved erroneous, for in the great majority of cases the pus at the time of operation is free of organisms. To overcome this threatening danger the general peritoneal cavity was walled off with gauze, a procedure which is eminently proper and still obtains among all careful surgeons. Winter suggested the careful aspiration of the pus sac before attempting its enucleation—a procedure still to be borne in mind in difficult cases, where rupture is likely to take place during the enucleation of the abscess sac.

In studying the mortality following salpingo-oöphorectomy Mandl and Bürger have found that cases of acute pyosalpinx in comparison with chronic cases, such as adherent appendages, hæmatosalpinx,

hydrosalpinx, etc., are followed by a much higher death-rate. In other words, the percentage in the first class is not far from 12 per cent., whereas in the second it averages only 4.5 to 6 per cent., or about one-half. Schauta, who at one stage of his work warmly advocated the Mikulicz gauze drain, instituted the bacteriological method of determining what cases to drain. Cover-glass preparations were made in the course of the operation; if micro-organisms were found drainage was employed, otherwise not. In thirty-five cases in which the pus was sterile no death occurred; in thirteen fatal cases, on the other hand, micro-organisms were found in eleven (three gonococci and three streptococci).

A point which interests me very much is Schauta's change of attitude relative to drainage. First we see him championing, almost without reservation, the free use of the Mikulicz drain; then we see the indications for its use limited to only those cases in which the pus contains micro-organisms, as shown by the microscope at the time of the operation; and, finally, we find him admitting that the undrained cases show as good or even a less percentage of deaths than the drained. Notwithstanding this most significant result, he still claims it is better to drain those cases where pus has escaped and bathed injured or raw tissues. This point I cannot even concede, for I feel that even in such cases drainage is superfluous, and that which is superfluous in medicine or surgery may be dangerous.

Of 216 cases of salpingo-oöphorectomy under Schauta's service 56.6 per cent. were entirely healed—a percentage similar to that of other operators. Thus, Chrobak claims that only half of his cases were permanently relieved, while Bardenheuer and Landau claim at the highest 60 per cent. of satisfactory cases.

From this review of their cases it will be seen that Hegar's most promising operation did not prove to be a cure-all, for a considerable percentage of women subsequently suffered intensely from exudates about the stump, perimetritis and metritis, adhesions, etc., not to speak of the exaggerated neurotic climacteric symptoms which supervened in many of the cases.

To circumvent the formation of the exudate in the interstitial part of the tube both Fritsch and Mackenrodt suggested the removal by a wedge-shaped excision of this part of the tube and uterus. Even this modification was not altogether satisfactory; consequently such well-known operators as Zweifel, Kelly, Säger, and even Fritsch, who offered the above suggestion, began to perform total extirpation of the tubes, ovaries, and uterus.

From this review, therefore, it would appear that Schauta's chief reasons for giving up the simple salpingo-oöphorectomy were the larger

percentage of failures in permanent cures, and he therefore turned to the more radical removal of the ovaries, tubes, and uterus as an operation more likely to give complete symptomatic relief.

Let us see what this operation brought forth.

Hystero-salpingo-oophorectomy. RADICAL ABDOMINAL OPERATION. In the cases which were not permanently cured after simple salpingo-oöphorectomy the patients complained of irregular bleeding without a true recurrence of menstruation. In addition, there was usually a free leucorrhœa, causing great discomfort and irritation. The subsequent contraction of adhesions about the uterus also induced marked deviation in the size and location of the uterus, which in turn gave rise to more or less severe symptoms. From these sequelæ the principle was established that when even the tubes and ovaries were sufficiently diseased to require extirpation the uterus must be likewise removed.

Some time before Schauta had come to this conclusion numerous American gynecologists were already advocating and carrying into effect this principle. Polk, Pryor, Kelly, Penrose, Baldy, Cushing, and others reported a considerable series of cases with more satisfactory results than when the simple salpingo-oöphorectomy alone was performed.

In Europe, von Rosthorn, Veit, Bardenheuer, and others were likewise removing the uterus with the appendages, and all were better pleased with this than with the old method. While the operation appeared to be a more difficult and dangerous one, in practice it was really attended with little greater if as great mortality. As to permanent cures, the results were infinitely more satisfactory. As previously stated, the persistence of the old symptoms and the occurrence of new and perhaps worse symptoms were noted in from 50 to 60 per cent. of cases, while in the radical abdominal operation there were 81 per cent. of symptomatic cures.

From this review it will be seen that the radical operation is to be preferred to the simple removal of the ovaries and tubes. Under such good results as these why should Schauta largely abandon this operation for vaginal hysterectomy? Let us see. As will be noted in his own statistics, his argument must be a strong one if those of us who almost invariably elect the abdominal route for hysterectomy are to be convinced of the greater utility of the vaginal route.

Radical Vaginal Operation. HYSTERO-SALPINGO-OOPHORECTOMY PER VAGINAM. As a result of his experience with the vaginal operation for cancer of the uterus, Péan, of France, in 1891, recommended the same operation for inflammatory diseases of the uterus and appendages, arguing that the removal of the uterus would give perfect drainage and thus permanently relieve the disease.

As with the Hegar operation, however, it was found after a time that

the ultimate results were not entirely satisfactory ; hence such men as Leopold, Landau, and Schauta, in Germany ; Péan, Doyen, and Segond, in France ; Jacobs, in Brussels ; Polk, Edebohls, and others, in the United States, began to institute the more radical removal of ovaries and tubes with the uterus.

As Mandl and Bürger recognize the strong objections offered by the opposing school of surgeons who adhere to the abdominal method of operating, they endeavor to dispose of these objections in such a way as to leave little or no argument against the vaginal operation.

While they may have convinced themselves that their views are the safe and final ones, I feel assured that their opponents still have a very strong case and are by no means silenced. First, in answer to the objection that the uterus is tied off and possibly removed before the appendages are brought into the visual field sufficiently to determine the extent of the pathological process : These writers claim that before the parametrium is ligated the vesico-uterine pouch is opened, and either the appendages are palpated or, better still, are actually hooked down and brought out into the vagina for inspection.

At this point I cannot forego the criticism that the latter manœuvre is most difficult, if not impossible, where the vagina is narrow, as is so often the case in young women suffering with pus-tubes.

While Mandl and Bürger claim that one tube alone may be removed in this way, they nevertheless show that their inclination is toward the more radical view when they argue that as the uterus has first been a primary point of infection, and is likely to give further trouble or become re-infected, it should be removed. This argument I cannot agree with, for we constantly see the most perfect healing follow simple vaginal incision and evacuation of pus. If one accepts this primary hypothesis of these writers, then it must be admitted that their radical treatment is justified. Such premises, however, in view of the good results obtained by less radical measures, are not fully justified.

These writers are prepared to resort to the abdominal incision at any stage of the vaginal hysterectomy in which the operation proves to be too difficult. In all cases, therefore, the patient is prepared for this eventuality.

In answer to the objection that the peritoneum is very likely to be contaminated by the rupture of pus sacs, they contend that the surface of peritoneum exposed by the vaginal operation is much less than an abdominal operation. Here they make a statement which will not be admitted by the good abdominal surgeon, for one of his first objects after making the abdominal incision is to so thoroughly protect the general peritoneal cavity with gauze packing that even though an abscess ruptures the peritoneum is hardly touched, for the gauze at once takes

up the pus. By the use of rubber gloves, which are frequently rinsed, the most careful technique may be preserved.

A point in favor of vaginal hysterectomy made by Schauta is at least theoretically correct. He claims that in vaginal hysterectomy the adhesions which have already formed for the protection of the peritoneal cavity are not disturbed, hence the general peritoneal cavity is not invaded; also that drainage is better toward the vagina, a point not to be denied.

In reply to the criticism that intestinal injuries are frequent, Schauta's assistants say in severe cases this is unavoidable by either the vaginal or the abdominal route. This statement is true, but one must not forget that in abdominal cases the lacerations of an intestine are noted at the time of operation and can be repaired promptly and efficiently, whereas in vaginal cases only the post-operative course demonstrates this complication in many instances.

In case of an intestinal injury Schauta draws the intestines down into the vagina and repairs the laceration with an intestinal suture. If the injured intestine cannot be reached in this way the abdomen is at once opened and the injury repaired. Relative to intestinal injuries, Mandl and Bürger claim that Schauta has never lost a case from this accident, and that in several instances spontaneous cures of the fistulae have taken place.

An admitted objection to the vaginal operation noted by these writers is the leaving behind, in very adherent cases, of pieces of the abscess or cyst wall or an adherent diseased ovary, which has subsequently led to further symptoms.

In considering the very low mortality reported by Schauta one must admit, without further question, that his immediate results are highly satisfactory and cannot be improved upon by the abdominal surgeon, for in 116 cases of vaginal hysterectomy for suppuration only three died, a percentage of only 2.6 per cent. One patient died of hemorrhage, another from ligation of a ureter, and the third from intestinal obstruction. Not one case died of peritonitis.

From these results even the most carping critic must admit that vaginal hysterectomy in the hands of a skilled surgeon is a very safe operation so far as immediate mortality is concerned.

Relative to final statistics, they record that 113 women were discharged from the hospital, of whom sixty-four, or 81 per cent., were entirely healed, as shown by the subsequent history of the cases, and fifteen cases were improved.

From Mandl and Bürger's review of Schauta's cases they conclude that in all inflammatory diseases of the pelvis where operation is indicated vaginal hysterectomy is the operation of election.

Salpingo-oophorectomy Unilateralis per Vaginam. In Mandl and Bürger's consideration of this subject I gain the impression, as a critic, that the total ablation of the uterus, ovaries, and tubes has been rather a wholesale procedure, and that the less radical procedure is to be counted exceptional. This remark is made incidentally, for upon this score I shall criticise the vaginal method in my concluding remarks. They report twenty-one cases, with a mortality of 11.1 per cent.

In this operation they especially warn against the rupture of pus sacs during the operation. In the event of this accident they at once examine the pus; if it is sterile they cleanse the pelvis and close the vaginal wound. If it contain micro-organisms they drain or remove the uterus, in order to make a free pelvic exit.

Vaginal Incision. In considering this subject Mandl and Bürger refer to the history of vaginal puncture and incision, and show how it originally was merely a life-saving resort; but that, in recent years, some gynecologists have returned to this method as a conservative measure. In other words, the oldest method for the evacuation of pus in the pelvis, comet-like, has made a cycle, and has again become the most recent method. A long array of names of eminent European gynecologists appear in the recent literature upon this subject, many of whom ardently speak in favor of vaginal incision; some are lukewarm as to its efficacy, while others condemn it as an inefficient procedure.

Schauta ranks foremost among the latter class. He draws attention to the dangers of an abdominal operation during a high fever, which his assistants discuss at some length. Investigations of the last five years have shown that in the majority of peritoneal pelvic inflammatory cases the pus becomes sterile by the time the case has become sufficiently serious to demand operation. Fever of a moderate or high degree is more likely to indicate the presence of active, virulent organisms, and an abdominal operation in their presence is always hazardous. Therefore Schauta especially warns against precipitate operation during the acute stage, and advises waiting until the case has become afebrile.

When, however, an abscess of the tube or ovary is present, and the patient's condition is so precarious as to make the tentative policy dangerous, Schauta believes, as a temporizing measure, that vaginal incision and evacuation of the pus may be necessary to tide the patient over the critical point. He has only performed this operation in twenty cases, demonstrating, therefore, that he does not find this indication a frequent one. From a study of these twenty cases Schauta says the immediate results are good, but as a remote sequel a more radical operation is usually necessary.

In conclusion they say the vaginal incision is an operation of necessity, serving only to tide the patient over the immediate threatening danger.

Abdominal Incision of Abscesses of the Tubes and Ovaries. Only five cases have been treated by abdominal incision, which at once indicates the very slight employment of this operation by Schauta. He believes it should only be resorted to when the topographical position of the abscess is such that it cannot be reached through the vaginal incision, and, like the vaginal incision, is an operation of necessity and only of value in very adherent cases in which the removal of the abscess sac is very dangerous on account of the virulence of the pus, or where it is so adherent as to make enucleation impossible.

Their final conclusions, after the review of all of Schauta's cases, are as follows :

1. The vaginal operation is the one of election for purulent collections in the appendages.

2. Double salpingo-oöphorectomy for purulent collections by the abdominal route is unsatisfactory because of the disadvantages peculiar to an abdominal incision, and has, therefore, been abandoned in Schauta's clinic.

3. The unilateral extirpation of suppurative adnexæ by abdominal incision is only advisable when the process is limited to the one side, the opposite being presumably entirely normal. Only through tentative waiting or the examination of pus obtained by exploratory puncture is the harmlessness of the pus proved.

4. The abdominal operation is indicated in those cases in which the vaginal operation is technically impossible.

5. The radical vaginal operation (hystero-salpingo-oöphorectomy) is the operation of election when both sides are involved in the suppurative process, or when one side is thus involved and the other is chronically inflamed.

6. Unilateral vaginal salpingo-oöphorectomy should only be performed under the conditions summarized in conclusion 3. To determine the virulence of the pus a bacteriological examination should be made before the operation is completed.

7. Vaginal incision is only an operation of necessity, and cannot be considered a rival of the more radical vaginal procedure. Notwithstanding the desire for conservative measures, the results of this operation are not encouraging.

8. The abdominal incision of an abscess of the ovaries or tubes is only to be performed in extreme cases, such as noted above in the text.

In considering Mandl and Bürger's article I am impressed with its strength and its weakness—strong in the consideration of the radical treatment of pelvic inflammatory diseases, weak in the meagreness of their statistics from which they condemn the less radical measures.

I have no desire to criticise the technique of vaginal hysterectomy in

these cases or the ideal immediate results. Both are above criticism. I do, however, very seriously question the wholesale application of the radical method as employed in Schauta's clinic.

While in the hands of a skilled operator vaginal hysterectomy for serious pelvic inflammatory lesions may not only be safe, but very satisfactory from the stand-point of ultimate cure, nevertheless in the hands of equally skilled surgeons the abdominal method is quite as safe, equally curative immediately, and far more satisfactory as to the ultimate results. The serious objection to this operation, which Mandl and Bürger have attempted to offset, is that it does not permit of careful inspection of the diseased structures, and after it is once begun the operation must be carried to a radical ablation of the uterus at least. In view of the fact that in the hands of judicious surgeons less radical measures have given a large percentage of perfect cures, I incline first to the conservative measures, and in the event of their failure the more radical operation may be resorted to with a clear conscience that nothing less will promote a cure. This may entail a second operation, but is it not better to take this risk than to at once deprive a young woman of her sexual attributes?

Pelvic inflammatory lesions occur most frequently in young women in whom the abrupt cessation of the menses brings serious nervous disturbances.

It is unquestionably true that many of the conservative measures are by no means satisfactory, but in every series of these cases a considerable proportion are made well. For this reason I never resort to vaginal hysterectomy, much preferring the abdominal incision, which permits a careful scrutiny of the diseased organs. If hopelessly diseased, the radical measure may be instituted; but, as is found in many cases, the ovaries may be left, and thus at least the disagreeable sequelæ following complete ovariectomy are greatly ameliorated or entirely avoided.

While I must agree with Schauta that the vaginal drainage of a pyosalpinx is very likely to be followed by further trouble, yet I have seen numerous cases where symptomatic cures have resulted. For the other forms of pelvic abscess vaginal incision and drainage give most gratifying results. Therefore, in conclusion, my objection to Schauta's position is that it is too radical and leaves little opportunity for conservatism.

The Scope of Vaginal Section in the Treatment of Pus in the Pelvis. Relative to the operative treatment of purulent accumulations in the pelvis, Reynolds and Freidman¹ believe that in view of the great

¹ Boston Medical and Surgical Journal, December 5, 1901, vol. cxlv., No. 23.

mortality due to peritoneal infection, caused by the opening of infected masses within the abdomen, therapeutically good results may be obtained by thorough vaginal drainage.

Four advantages of the vaginal over the abdominal route in cases where liquid pus is isolated by more or less heavy walls of exudate are :

1. The risk of general peritoneal infection is greatly diminished ; for with proper technique the vaginal incision becomes a dissection by means of which each layer is seen before it is incised and the pus is reached long before there is danger to the general cavity, which lies above the abscess and is separated from it by a wall of exudate.

2. Excellent drainage can be secured and maintained because of the vent at the bottom of the pocket. This should be wedge-shaped, that is, the outlet should be made as broad as the greatest width of the pocket to be emptied.

3. Vaginal herniæ are rare sequences of vaginal section.

4. Severe post-operative shock is almost unknown. They add a report of 82 abdominal sections without a death, and of 18 vaginal sections with 1 death due to accidental cause.

Posterior Vaginal Cœliotomy in Operation for Pelvic Disease. William Alexander¹ takes a similar stand with regard to the operative treatment of purulent collections in the pelvis. He states that his object is in no way to detract from the abdominal route, and qualifies this by the statement that in the last two years he has performed 204 abdominal cœliotomies to 94 posterior vaginal cœliotomies. His method in the posterior vaginal cœliotomy is as follows :

After thorough antiseptics of the vagina, cervix, and external genitalia, with the patient in the recumbent position, buttocks raised, knees flexed on abdomen, a duck-billed speculum is inserted. An assistant closes the cervix and draws it forward by means of a volsellum forceps in both cervical lips.

Douglas' pouch is exposed by pressure from the speculum, the attachment of the vagina to the uterus is snipped open by scissors, as is also the bulging peritoneum. After exploration and breaking up of the adhesions and cleansing the vagina, gauze drainage is inserted. The drainage is finally removed at the end of one week. Three weeks completes the treatment. When visual evidence is necessary during an operation, the speculum is pushed into the pelvis, and manipulation by sponges on holders will expose the part.

Ovarian tumors are aspirated and then pulled down. Pedicles are treated by forcipressure, though the ligature would be preferred but for the difficulties and danger of applying it. The wound closes of its own

¹ British Gynecological Journal, Part lxvi., page 130.

accord. When non-suppurating structures have been removed, the gauze is changed in forty-eight hours and the clamps are removed, and everything is then left undisturbed for the rest of the week. The vagina is mopped out in a fortnight and is douched if the wound has closed.

In suppurating cases, dressings are changed every second day, the cavity is cleansed by cotton, and dry dressings are used.

Of his 94 posterior vaginal cœliotomies two died. The convalescence in most cases was normal.

He thinks that the results obtained from these 94 cases is much better than if abdominal operation had been performed. All ovarian cysts which do not rise into the abdomen should be removed by this method. Cystic ovaries are generally comparatively free, elude bimanual pressure, and a diagnosis of hysteria is unjustly made.

The advantage of posterior vaginal cœliotomy is its safety. It is also of great use in clearing up the diagnosis in doubtful cases.

Hot Air in the Treatment of Pelvic Exudates. O. Ponano¹ recommends in the treatment of chronic pelvic exudates a method of hot air similar to that used for chronic joint diseases. Cases of recent inflammation are excluded. He reports several cases thus treated, with very satisfactory results. In one a hard exudate in the right iliac fossa extending to the umbilicus was completely reduced in twenty treatments. In another case of chronic inflammation a sensitive tumor the size of a small apple, after twelve applications of hot air, was reduced to a slight thickening of the tissue. The apparatus is described in which the patient is placed and subjected to a temperature of 120° F. for twenty minutes on the first day, and with daily increase, reaching in some instances 135° F. to 150° F. for forty-five minutes.

In some cases a speculum of some material not conducting heat is introduced into the vagina, remaining there during the baking. To relieve cerebral congestion a cold, damp cloth may be placed on the head during the treatment.

Ponano's observations show that the hot air therapy causes a rapid and powerful absorption of the exudate.

Further experience will determine whether this method will serve as a permanent addition to the list of gynecological remedies.

PARAMETRITIS POSTERIOR.

In the original consideration of pelvic disease long before abdominal surgery reached its present stage of perfection all inflammatory attacks

¹ Centralblatt für Gynäk., July 27, 1901, No. 23.

were classified under the general generic term of pelvic cellulitis. Unquestionably this classification is still applicable to a limited number of cases, but the great majority may be more specifically localized; and, further, this classification of cellulitis may be looked upon as more or less general, for it may further be subdivided into accurately classified divisions. Unquestionably in true cellulitis there is an involvement of the connective tissue of the broad ligament, the uterosacral ligaments, and the connective tissue along the pelvic walls. In this way the broad ligament may become gradually thickened, spreads out at its base, then assumes a hard, indurated feeling, and finally undergoes suppuration, terminating in a true pelvic abscess. In this inflammatory process both veins and lymphatics are involved, the latter, however, more extensively.

As to parametritis posterior, Paul Brose¹ has lately taken up the study of the subject and has carefully reviewed its literature.

B. S. Schultze, of Jena, a true pathfinder in gynecology, was the first to call especial attention to this form of pelvic inflammatory disease. He described the uterosacral ligaments, which swing backward from the cervix to the sacrum, carrying elastic, connective, and smooth muscle tissue along with large lymph channels. In inflammations of these ligaments, which may pass through all of the various stages, from the acute to the chronic process, with a persistent tendency to acute exacerbations, and finally ending in cicatricial contraction, Schultze finds a marked cause for malposition of the uterus. The relationship of the pelvic connective tissues to the broad ligament and uterus was first studied with especial care by William Alexander Freund, of Strasburg, and from his researches the pathology of this region was put upon a new basis. Freund believed there was a paraproctitis which led to an atrophic shrinking of the uterosacral ligaments and thus produced distorted positions of the uterus. These two conditions—parametritis posterior (Schultze) and paraproctitis atrophicans (Freund)—are unquestionably similar if not identical in their pathology. Schultze describes a case in which there was an almost complete closure of the rectum as a result of the excessive exudation in this region, necessitating the establishment of an artificial anus. After several weeks of local treatment this exudation in the uterosacral ligaments gradually disappeared, and it was possible to close the artificial opening. In many of these cases the symptoms are less threatening, and the patient as well as the family physician ascribe the pain to hemorrhoids. In one case referred to by Brose the surgeon operated upon the hemorrhoids without recognizing their true significance, overlooking entirely the fact that they are only a sign of an inflammatory condition of the para-

¹ Zeits. f. Geburts. u. Gynäk., Band xlvi., Heft 1.

metrium which had obstructed the hemorrhoidal vessel. Vesical symptoms may arise as a result of the retraction of the cervix and the marked shoving forward of the uterus upon the bladder. Through the fixation of the cervical portion of the uterus by the shrinking of the uterosacral ligaments the uterus becomes more or less fixed in this forward position, thus limiting the distensibility of the bladder, which in turn leads to frequent and painful urination. Dysmenorrhœa also becomes a marked symptom in these cases. As a result of the inflammatory condition the patient complains of intense sacral backache, pain in both sides, and marked nervous disturbances.

In the normal individual the uterosacral ligaments are found as comparatively loose cords swinging back from the cervix to the sacrum. In parametritis posterior they are greatly thickened, dense, considerably shortened, and very painful to the touch. The true nature of the inflammatory process may best be discovered by a rectal examination. Chronic parametritis posterior is very resistant to treatment, and produces serious functional disturbances as a result of excessive ante flexion of the uterus. In many instances this inflammation is accompanied with cervical catarrh, endometritis, peri-oöphoritis, and salpingitis. In these instances greater pain comes from the parametritis than from the latter diseases; in fact, the posterior metritis explains in many instances the reason why patients continue to suffer after the extirpation of inflamed ovaries and tubes, for the condition which has given rise primarily to the chief pain has not been remedied by this plan of treatment, for the uterosacral ligaments remain chronically inflamed, and are stiff, hard, and exquisitely tender.

As to the question of etiology, puerperal infection is unquestionably the chief source of this inflammation, although it may occur in women who have not borne children. Brose is also convinced from his study of these cases that gonorrhœa of the rectum is not infrequently an exciting cause of this parametritis. In the pathological study of these cases it has been shown that in the early stage the connective tissue is thickened, acutely reddened, and softened as a result of lymphatic infiltration. This in its retrogression to the chronic condition greatly decreases in size, and finally a cicatricial atrophy may occur. The overlying peritoneum is at first reddened and thickened and very painful to the touch. In a study of this class of cases Küstner has reached the conclusion that it is more truly a peritoneal inflammation than a parametritis; in other words, he would look on it as a perimetritis or pelvic peritonitis. This observer has studied the cases which have come to him for operation. As a rule, he found double peri-oöphoritis and more or less extensive adhesions between the ovaries and the posterior layers of the broad ligament. For this reason Küst-

ner takes the view that by far the greater majority of these cases which Freund and Schultze would classify as parametritis are true pelvic peritonitis. Upon this point it is rather difficult to pass decisive judgment, but it would appear that, at least in the acute process, Küstner is right in many instances, for unquestionably in all cases of acute pelvic peritonitis arising from whatever source there is marked tenderness in the region of the uterosacral ligaments. This is easily explained, for just as the epitrochlear and axillary glands may become inflamed and tender when there is infection of the hand or fingers, so all infections of the ovaries and tubes would naturally lead to some hyperæsthesia of the posterior parametrium as a result of absorption of infectious matter through the lymphatic channels extending backward through the uterosacral ligaments to the sacral lymph glands.

Brose adds nothing to Freund's excellent description, but proposes as a curative measure in these cases to suspend the uterus in order to take off all weight from the parametrium, thus permitting its restoration to the normal. As a result of this treatment he says the uterosacral ligaments soon after operation become less sensitive, the marked infiltration of this region decreases, and these bands ultimately become softened and normal to the touch. He details ten cases, and as a conclusion says that he observed good results in all of the cases, the pain disappearing almost immediately after operation, the ligament, as just mentioned, returning to the normal.

In the fixation of the uterus he pulls it up as high as possible and employs the Olshausen method of attachment (sutures from the two cornua uteri to the peritoneum). In explanation of the cures of these cases he claims that the stretching of the chronically inflamed tissues of the uterosacral region is the chief factor.

In considering Brose's suggestion as to ventrofixation a note of warning must be offered, for by no means all of the cases of parametritis posterior can possibly be relieved by this surgical measure. If there is any tendency which should be frowned upon at the present day it is the subjection of all gynecological patients to surgical measures for their relief. Surgical measures, when indicated, are unquestionably of great curative value, but to subject even a minimum number of cases of parametritis to this method of cure would be certainly unjustifiable. If treated by hot douches and applications in many instances the inflammatory symptoms may be at least greatly ameliorated if not entirely cured.

I detailed in last year's *PROGRESSIVE MEDICINE* the treatment of pelvic inflammatory affections by means of compression and heat. In many of the pelvic inflammatory diseases temporizing measures may with safety be employed, and only in the event of the patient becoming progressively worse, or not tending to get well, should operative measures

be considered. Time and again I have seen serious cases of puerperal parametritis greatly benefited or entirely cured by the use of copious vaginal douches of very hot water (110° F. to 120° F.), and by the application of weight and heat over the lower part of the abdomen. In view of the fact that this experience has been so satisfactory, I am disinclined to act upon Brose's statement as to the advisability of ventro-suspension in these cases. Unquestionably in marked cases of retro-flexion in which the ovaries and tubes are sagging into Douglas' cul-de-sac, and the uterosacral ligaments are inflamed and shortened by chronic inflammatory disease, replacement of the uterus to its normal position is of signal curative value.

Brose's article serves one very good purpose, and that is to call renewed attention to the importance of the uterosacral ligaments in their relation to malpositions of the uterus and to pelvic cellulitis posterior. Only recently a very interesting case bearing upon this point has come under my observation, in which there was an old chronically inflamed laceration of the right side of the cervix. In this case the right uterosacral ligament was infected and could be felt as an exquisitely tender, thick band. The patient would cry out with pain the moment it was touched, whereas on the opposite side the ligament was only slightly sensitive. The repair of the cervix, followed by hot douches, within a very short time entirely relieved all symptoms.

CANCER OF THE UTERUS.

The Influence of Pregnancy and of the Climacteric upon the Ultimate Results of Radical Operation for Cancer of the Uterus. Not infrequently the gynecologist is confronted with a most difficult question to solve, viz., the treatment of cancer of the cervix complicated by pregnancy.

One of two positions may be taken: First, the cancer may be allowed to take its course, in order that the child may not be sacrificed before it reaches full term; or, second, the cancer may be promptly operated upon, with especial consideration for the mother's life, regardless of that of the child.

Strangely enough, French and German surgeons take diametrically opposite views upon this subject, the former claiming that the child's life only should be considered on account of the almost certain recurrence of the cancer, and the latter that an attempt to save the mother should be made at once by resorting to operation. In one of the meetings of the Paris Obstetrical Society, 1901, Bouilly, Pinard, Varnicee, Champetier, and De Ribes coincided in the conclusion that the first

rule should always be observed ; whereas in one of the German societies the opposite view was taken, the dictum being "operate at once."

If cancer which is operated upon during pregnancy will immediately recur, then the object of the operation is defeated, and, in addition, the child's life is destroyed. Such a question as this is therefore of vital importance, for not one but two lives hang upon the surgeon's decision.

Upon what grounds does the German base his radical statement, which is in direct opposition to that of the Frenchman ?

Hence,¹ one of the assistants in the Königsberg Gynecological Clinic has recently gone over this subject in a most careful way, in order to determine which of the two statements is based upon the best scientific data. He was able to collect statistics in 82 cases ; but adhering to Winter's rule, that only those cases which had passed five years without recurrence could be considered cured, there were only 41 of this number which could be studied from this stand-point. Of these 41 cases there had been 31 recurrences, leaving only 10 which were still well after five years. Thus only 10 cases out of 82 (12.2 per cent.) remained alive after five years.

He concludes from his study that the bad results in these cases are entirely due to the influence of pregnancy, birth, and the puerperium. This is explained upon the theory that there is an increased vascularization of the tissues during pregnancy ; consequently, the cancerous process spreads with much greater rapidity.

While Hence, without question, says that the results of operation during pregnancy are much more unfavorable, notwithstanding, from his study, he sustains the German principle of operating the moment the cancer is discovered, regardless of the child's life. If the cancer is permitted to extend throughout the months of pregnancy there will be little or no hope for the ultimate recovery of the mother as a result of a postpuerperal operation.

Having thus determined that cancer is very largely influenced by pregnancy, Hence then endeavors to ascertain if the opposite conditions such as obtain in women who have passed the climacteric act in a reverse way and retard the growth or recurrence of cancer in operative cases. For this purpose he was able to collect 55 cases from the literature in which there was a recurrence in only 24 ; in other words, 56.3 per cent. were healed by operation. Of this number 43 were cervical and 12 corporeal carcinoma. From the Königsberg Gynecological Clinic he collected 18 cases which survived the immediate results of the operation. Of this number 12 recurred, giving 33 per cent. which remained free from cancer.

¹ Zeitschrift für Geburt. und Gynäk., vol. xlv., Part I.

From this study of the opposite side of the question he comes to the conclusion that the climacteric exercises a decided retarding influence upon the growth of uterine cancer, and for this reason makes the recurrences in these cases less frequent after operation. As a final summary, therefore, he concludes that the radical operation upon uterine cancer during pregnancy gives the worst results; during or after the menopause the best.

In considering the two views of the French and German surgeons it appears that there is a possibility of each side being too radical, and that there is a happy medium between these two positions. In early pregnancy, when the cancer is closely localized to the cervix and offers a favorable clinical outlook, certainly no other course than the operative should be taken. If, on the other hand, the cancer is discovered in the late months of pregnancy it would seem to me, from my knowledge of the great frequency of the recurrences in puerperal and pregnant cases, that the child's life should be wholly considered, and operation should be delayed therefore until the eighth month. In one case to think only of the child would be quite as bad judgment as in the later course of the pregnancy to consider only the mother.

Local Treatment of Cancer of the Uterus. It is with considerable reluctance that I speak of the local treatment of cancer, for fear that in attempting to stay its progress in early stages the general practitioner will lose all possibility of effecting a cure by surgical means.

Radical surgical treatment is the only treatment in the early stages of cancer; if, however, the case is inoperable, local therapeutic measures may be instituted.

Howitz¹ was led to try ethyl chloride in the local treatment of cancer by the success obtained from the use of freezing mixtures in the treatment of *ulcus molle* and *lupus*, and he determined to try it in the treatment of cancer.

He reports 8 cases of carcinoma of the uterus and vagina and two of carcinoma of the breast thus treated.

Sound tissues turn rapidly white under a spray of ethyl chloride, whereas cancerous areas show little if any change in color. By this means we are able to distinguish the outlines of a carcinomatous growth. This gross change has been fully supported by microscopical evidence.

If a benign neoplasm or erosion is sprayed with ethyl chloride it promptly turns white under the spray; then follows suppuration, the surface granulates, and normal epithelium forms. After a carcinoma of the cervix has been sprayed in this way there is a subsidence of the inflammatory parametritis, and the organ becomes quite movable in case

¹ Journal of the American Medical Association, November 30, 1901.

there has been no extension of the growth to the broad ligaments. This serves as a good test for the possibility of complete eradication by a radical operation.

Howitz's method is simple, entirely harmless, inexpensive, and, he says, effective. The carcinomatous areas are first curetted, cauterized if necessary, and tamponed with gauze. After a few days he applies the freezing spray, and this is repeated every third day at first; later on at longer intervals.

Following the treatment in his cases, menstruation returned more or less normally; the patients gained in weight, partly he thinks from the removal of the malignant masses, and partly because of the superabundant feeding which he always instituted as part of the treatment. Recovery was impossible in each of his cases because of their advanced state, but the condition of the patient was improved and life was prolonged. The results stand for themselves, and require only a closing warning not to rely upon this measure in the early stage of cancer.

LOCAL TREATMENT OF THE ENDOMETRIUM.

Although in the last decade there has been a universal tendency to decri local treatment of the uterus, good may still be found in this procedure in properly selected cases. Certainly chronic endometritis has not yielded satisfactorily to curettage, and short of a radical operation there is little else than local treatment to recommend.

James C. Wood¹ says that there are many cases of gynecological disease in which local treatment must be described as worse than useless. Such cases are those of uterine displacement, periuterine and appendicular disease, cervical lacerations with ectropion, inveterate constipation with disordered circulation, malnutrition, etc. But there are some women in whom local treatment is the only form of treatment applicable, and others in whom there is no definite surgical indication, and yet there is a chronic leucorrhœa. Wood's innovation in the local treatment of these cases is the use of a spray or atomizer under thirty pounds pressure, such as are in common use by nose and throat specialists.

His usual routine is to first cleanse the cervix with a 50 per cent. solution of peroxide of hydrogen applied through a fenestrated speculum. He finds that an ordinary alkaline solution like Dobell's is very useful in removing the tenacious cervical mucus.

With his spray and thirty pounds pressure he claims to be able to

¹ "The Use of the Spray in the Local Treatment of Gynecological Diseases," *American Journal of Obstetrics*, March, 1901.

force a solution throughout the length of the cervical tract. In the same manner he applies his solution to Skene's tubules and the anterior urethra, taking care to obstruct the deeper urethra by pressure within the vagina.

Without experience in the use of the spray it is difficult to criticise or commend this method of treatment.

I can conceive of its being of value in chronic cases of endometritis, provided a sufficient reflux from the cervix can be established. To force a spray into the uterus under thirty pounds pressure without a free escape might cause it to be forced out into the abdominal cavity, with a consequent local peritonitis.

While this method may find a valued place in our armamentarium I would advise extreme caution in its use. Only intractable chronic cases should be first tried.

FIBROMYOMATOUS TUMORS OF THE VAGINA.

While fibromyomata are by all odds more frequently found in the uterus, nevertheless all parts of the genitalia may be the seat of these new-growths.

The round ligament, the tubes, and the ovary have all been affected in this way. The vagina is a much rarer site for them.

R. R. Smith¹ concludes after a study of 100 cases that fibroid tumors of the vagina are rare; they occur most frequently between the ages of thirty and forty years, but they have been observed in patients as young as twenty and as old as seventy years. The cases which have been reported as occurring in infants are open to some doubt.

The affection occurs apparently independently of civil condition. There is no proof that it affects fertility. When large the growth may obstruct labor. If they are small they rarely disturb coitus, and frequently cause no trouble when large. In some cases menstruation seems to be increased. When small the tumors rarely produce symptoms of consequence; when large they may prove to be the source of considerable suffering and even danger.

The symptoms, when present, are pain, hemorrhage, discharge, obstruction to the bladder, and rarely to the bowel.

The tumors may be either pure fibromata or pure myomata. The term fibromyoma is perhaps suitable for most of them.

The growth starts in the anterior wall twice as often as in the posterior wall, and may be sessile or polypoid. Their size varies consider-

¹ "Fibromyomatous Tumors of the Vagina," American Journal of Obstetrics, February, 1902.

ably. They are usually single, and, as a rule, are of slow growth, and are apt to undergo œdematous, necrotic, or ulcerative changes. The treatment is, of course, surgical.

ALUM ENEMA IN THE TREATMENT OF TYMPANITES.

In peritonitis one of the chief factors leading to a lethal terminus is the excessive tympanites incident to intestinal paresis, which in some cases completely defies all of the usual remedies, such as purgatives by the mouth and all of the various enemata.

Virgil O. Hardon¹ speaks of the dread occasioned by paresis of the bowel after cœliotomy, and asserts that all remedial measures for peritonitis which do not include thorough movement of the bowels are futile. A copious discharge of fecal matter is not absolutely essential; but enough peristaltic action to cause expulsion of gas, and thus relieve distention, is sufficient for the time, for fecal discharge will usually follow later. This fact makes it highly probable that distention of the bowel by gas is a cause as well as an effect of the muscular paresis.

The use of cathartics, as Epsom salts, in these cases is often contraindicated or impossible on account of nausea and vomiting. Catharsis by hypodermic injection is a failure. The ordinary enema of turpentine, glycerin, and water may be persistently ineffectual. A rectal tube passed up above the sigmoid sometimes allows the escape of some gas, but the absence of muscular power in the walls of the bowel and the overdistention of the small as well as the large intestine often render this procedure futile. Under such circumstances Hardon has employed for the past nine years enemata of alum, one drachm to the quart of water. He was led to use this by remembering that violent peristalsis is caused when alum is taken into the stomach. He has used this enema hundreds of times, and always with good results. It usually causes an expulsion of gas in from five to fifteen minutes. It may be repeated with safety any number of times. Pain follows its employment occasionally, but is never severe. When alum enemata have been repeatedly given for a number of times there may be thrown off from the bowel a cast consisting of mucus coagulated by the alum.

Hardon has no theory as to how alum acts unless it has a specific action as a peristaltic exciter, just as castor oil has when given by the mouth.

Alum does not cause serous exudation from the intestinal walls, and when depletion of the abdominal bloodvessels is important Hardon uses Epsom salts if the stomach will retain it.

¹ "The Alum Enema in the After-treatment of Abdominal Operations," *American Journal of Obstetrics*, June, 1901.

The advantage of the alum enemata is seen best in a certain class of desperate cases in which all other measures have failed and death is inevitable unless peristalsis can be excited.

This suggestion of Hardon's appeals strongly to me, and I shall unhesitatingly adopt it in the class of cases in which he especially recommends it.

VARICOCELE OF THE BROAD LIGAMENT.

Causes. A condition very rarely met with independent of other pathological lesions of the pelvis is varicocele of the broad ligament.

John B. Shober¹ suggests that as the ovarian veins are the analogues of the spermatic veins, their dilatation within the layers of the broad ligament may be spoken of as a varicocele of the broad ligament.

Dudley, of New York, reported four cases of this sort successfully relieved by coeliotomy. Malins, of Birmingham, reports two cases cured by excision of the veins. Baldy, Kelly, Hirst, and W. P. Wilson have reported other cases. Altogether eleven cases are found in the literature, and to these Shober added one more. That ovarian varicocele should occur does not seem surprising when we consider the enlargement and dilatation these vessels undergo during pregnancy and the rapid involution that follows during the puerperium. If anything prevents this involution a permanent dilatation of the veins may result, and this would naturally be apt to occur in these veins because of their length and anatomical relations. The right ovarian vein empties into the inferior vena cava at an acute angle, whereas the left ovarian empties into the renal vein of that side at a right angle.

The circulation of the broad ligament undergoes a physiological disturbance during the sexual relation and during menstruation. When, however, by reason of inordinate sexual indulgence, inflammatory changes, or malposition of the uterus the condition persists it becomes a pathological condition.

Anything which tends to obstruct the free return of blood through the ovarian veins acts as a predisposing factor. As general causes, are enumerated (1) deficient power in the right heart from organic cardiac or lung disease ; (2) liver affections and disorders of the digestive tract ; (3) obstruction of the portal system ; (4) renal disease affecting the tone of the vessel walls.

The exciting causes are (1) subinvolution after labor or abortion ; (2) extensive laceration of the cervix into the broad ligament ; (3) dis-

¹ "Varicocele of the Broad Ligament," *American Journal of Obstetrics*, May, 1901.

placements of the uterus and inflammatory adhesions ; (4) chronic constipation.

The Symptoms of Broad Ligament Varicocele are differentiated with difficulty from those due to the venous dilatation *per se* and those due to associated pathological conditions. A sense of weight and fulness in the pelvis, most marked at the sacrum or the perineum, and sometimes extending upward to one or the other kidney, are more or less characteristic of varicocele. Much stress is laid on the fact that all the symptoms are aggravated by the upright posture and that they are almost immediately relieved by lying down.

The Diagnosis is reached by a consideration of the history and symptoms and by finding on bimanual examination (best per rectum) a yielding, compressible mass, sometimes the size of a hen's egg, in the broad ligament.

The Line of Treatment to be pursued depends upon the case. If there are no associated surgical conditions which justify operative interference we may try graduated exercise, rest in the recumbent posture, regulation of the bowels and diet, combined with hot vaginal douches, cervical puncture, and the use of a pessary if there is backward displacement of the uterus.

In the active surgical treatment of the affection three modes of operation have been employed :

1. Excision of the veins in a V-shaped mass and bringing the cut edges together with sutures.
2. Purse-string suture and extirpation of the mass.
3. Ligation of the veins at various points one inch apart with silk.

The author quite properly does not consider it permissible to remove healthy adnexæ in order to relieve this condition or to facilitate the operation.

UTERINE HEMORRHAGE.

Apoplexia Uteri. All hemorrhages from the uterus occurring about or after the menopause should be looked upon as coming from a malignant source until proved otherwise. It is never safe to treat such cases symptomatically and pass over as trivial this symptom.

Fortunately, by no means all atypical hemorrhages about the climacterium are of malignant origin, but this fact must first be established before treatment is instituted.

Palmer Findley¹ reports a case of so-called "apoplexia uteri." Herman, Gebbard, Martin, Küstner, Müllerheim, and S. Pozzi have

¹ "Arterio-sclerosis of the Uterus," American Journal of Obstetrics, January, 1901.

reported such cases without going into a careful study of them. Rein-
ecks described in detail four cases occurring in the clinic of Leopold, of
Dresden.

The term "*apoplexia uteri*" is badly chosen, and was applied origi-
nally by Cruveilhier to a condition of the uterus characterized by arterio-
sclerosis of the uterine arteries, with hemorrhagic infiltration of the
endometrium.

The etiology of the affection is obscure. It is likely that the causes
of arterio-sclerosis elsewhere, such as alcohol, malaria, lead, and syphilis,
may obtain here; but in the natural post-climacteric involution of the
uterus an organic sclerosis may occur independent of a general arterial
change. It is usually found in women between the ages of fifty-two
and eighty-seven years. Pregnancy, menstruation, and inflammatory
conditions of the uterus may have some causative bearing. The lesion
exists perhaps more frequently than is supposed, and many cases of
so-called "*senile endometritis*" or "*hemorrhagic metritis*" might be
better classified as hemorrhagic infarctions of the uterus, with arterio-
sclerosis and calcareous degeneration of the uterine vessels.

In these cases of *senile endometritis* or *hemorrhagic metritis*, where
they are unaccompanied by *leucorrhœa*, when there exists no new-growth
and no displacement of the womb, or any adnexal disease that might
account for the symptoms, and if under these conditions a diagnostic
curettage gives negative results, then we may ask whether there is not
present a diseased condition of the uterine vessels which has produced
hemorrhagic infarction.

In that variety of case usually styled "*hemorrhagic*" *metritis* the
womb is found hypertrophied and dense; but here it is true in many
cases that the primary cause is in the bloodvessels, and that the hyper-
plasia of the uterine musculature is but secondary.

It cannot be gainsaid that arterio-sclerosis of the uterine vessels may
exist without giving rise to any symptoms, so that the existing cause of
the clinical manifestations under discussion may be looked for in some
obstruction to the venous or return circulation, such as visceral disease
or general arterio-sclerosis.

In the treatment of this condition one must consider the social condi-
tion of the patient and the severity of her symptoms.

Any case under palliative treatment may progress and become so
serious as to demand vaginal hysterectomy.

In the less severe cases, if the woman is able to take prolonged
periods of rest, the use of ergot, styptics, and iodoform and gauze tam-
ponades may answer every indication.

Of the more recent remedies, adrenalin promises to be one of the
most satisfactory yet suggested. I am in the habit of giving this

remedy in the minimum dose every two hours until the hemorrhage ceases, and in every instance have obtained most satisfactory results. The physiological limit may be noted in the high tension pulse and nervous irritability or excitement of the patient. In sufficient doses it may produce a toxic effect.

Strengthening of Uterine Contractions and Checking of Metrorrhagia with Suprarenal Extract. It is with no little interest that gynecologists and general practitioners may look for a most efficient remedy in adrenalin for the excitation of uterine contractions and the control of irregular bleeding not due to a grave pathological lesion. For more than a year I have been using adrenalin (a preparation made by Parke, Davis & Company) for the control of irregular uterine bleeding incident to functional disturbances of menstruation. I have been led to its use in this condition as a result of the study of its physiological action in bleaching or contracting mucous membranes in general. In several instances most satisfactory results have been obtained in cases of excessive menstrual bleeding which had not been checked by one or even more curettages. In these cases the adrenalin was injected during the hemorrhage directly into the uterine cavity with a slender Braun's uterine syringe.

The administration by the mouth of this extract or physiological active principle of the suprarenal gland has also proved valuable in some cases.

E. A. Schafer, Professor of Physiology, University of Edinburgh,¹ from experiments made in his laboratory by Slight, Malcolm, and Frost, feels justified in suggesting the use of the extract of the suprarenal gland whenever uterine contractions are to be strengthened or induced.

These observations show that this extract far exceeds any other drug with the same reputed action in producing contractions of the uterine muscle during pregnancy and otherwise. This is true whether the drug is applied locally or introduced through the circulation.

The active principle of suprarenal extract is not affected by the gastric juice, so that it may be administered by the mouth. In post-partum hemorrhage, however, it is better to inject it directly into the uterine cavity, where it contracts almost immediately the uterus and its arterioles.

The solution recommended for this purpose is an infusion of the dried medullary substance, 30 grains. It is well to add to this solution 60 grains of calcium chloride.

Sterilize the solution by boiling and inject while moderately hot. The extract is prepared by powdering separated healthy medulla of the

¹ British Medical Journal, April 27, 1901.

suprarenal glands of the ox or sheep, dried rapidly in thin layers at a temperature of 50° F. The powder should be kept in well-stoppered bottles.

Stypticin in Uterine Hemorrhage. Another remedy has been extolled by Boldt.¹ He says that stypticin was so called by its discoverer, Prof. Martin Freund, on account of its hæmostatic properties, but that its technical name is cotarnine hydrochlorate. Stypticin is an alkaloid obtained from opium by the oxidation of narcotine, occurring as a minutely crystallized yellow powder having an intensely bitter taste. It is insoluble in water, the solution becoming darker on exposure to light. Boldt quotes the conclusions on its physiological action, arrived at by Edmund Falk,² of the Pharmacological Institute of Berlin, upon which he bases its therapeutic action.

In Boldt's experience stypticin has been useful in the following varieties of cases :

1. In virgins without demonstrable gross lesions in the pelvic organs, who are subject to profuse and irregular menstruation and who become anæmic and weak. When there is both irregularity and profuseness the drug should be taken in dose of 0.05 gramme, t. i. d., except during menstruation, when it should be exhibited every two or three hours. When the periods are irregular but profuse, then the drug should be started four days before the expected flow.

2. In menorrhagia from subinvolution of the uterus following full term delivery.

3. In the hemorrhage from endometritis post-partum continuing after the uterus has been thoroughly cleaned of placental or decidual remnants.

4. In women with atypical menorrhagia near the climacterium, when no lesion can be found.

Treatment with stypticin is unsatisfactory in the following conditions :

1. Hemorrhage from endometritis, metritis, retroversion or pelvic inflammation.

2. Fibromyomata.

3. Malignant growths.

If a quick action of the drug is required, it may be given hypodermically. Two or three grains dissolved in sterile water should be injected into the buttocks. This may be repeated in four to six hours. After several subcutaneous injections, when the immediate effect is usually obtained, the remedy may be given by the mouth either in capsules or tablets.

¹ "Stypticin in Uterine Hemorrhage," American Journal of Obstetrics, July, 1901.

² Therap. Monats., Band x., No. 1.

EXTRA-UTERINE PREGNANCY.

Ovarian Pregnancy. Although several quasi cases of abdominal pregnancy in which the ovum has been supposedly fertilized and generated in the peritoneal cavity have been reported, not one has withstood a critical analysis, and this classification may, therefore, unqualifiedly be discarded.

With ovarian pregnancy, however, it has appeared otherwise, for while only a very few cases have been granted a permanent record, they at least have seemed to be scientifically established as such.

In the midst of this assurance, Webster, of Chicago, whose splendid monograph on ectopic pregnancy has made him an authority on this subject, analyzes these cases and reaches the conclusion that here, too, there is a mistake, and that there is no primary ovarian pregnancy. He bases his argument on the ground that only the Müllerian duct, which is converted into the Fallopian tube and the uterus, is capable of furnishing a genetic tissue sufficient to promote the growth of the fertilized ovum.

While credence must be given to Webster's theory, I nevertheless am not fully convinced of the correctness of his position. It seems to me that the Graafian follicle may serve as a bed for the fecundated ovum, and yet my belief rests more upon theory than upon actual observation.

Webster¹ has stated in his monograph on ectopic pregnancy in 1895, that there is no proof that a pregnancy has ever started in an ovarian follicle.

The case of Dr. Catharine van Tuessenbroek, demonstrated at the Third International Congress of Gynecologists and Obstetricians, in Amsterdam, 1899, as one of ovarian pregnancy in which the fertilized ovum had begun its development in a Graafian follicle, forms the basis of Webster's critical article.

The diagnosis as to the original site of an ectopic pregnancy, either at the post-mortem or at the operating-table, must be made with great care. In many cases, owing to extensive adhesions, organized blood clot, displacement of pelvic and abdominal structures, etc., it is impossible to be certain of the original location.

The only way to prove the topographical relationship in some of the advanced cases is by means of sections of the frozen body with the pelvic organs undisturbed, followed later by a painstaking dissection and microscopical examination. Thus Berry Hart and Webster each proved cases of supposed primary abdominal pregnancy to be ruptured tubal

¹ "The Question of Ovarian Pregnancy," *American Medicine*, December 21, 1901.

pregnancies. Certain conditions that may resemble ovarian pregnancy must be excluded before this diagnosis is justifiable.

Hæmatoma Ovarii. This condition is usually considered to be due to an extravasation of blood associated with the destruction of an ovarian pregnancy—an assumption without proof in the great majority if not all of the cases, for the diagnosis of pregnancy in such cases could only be established by the discovery of an embryo or of chorionic tissue. Pregnancy in an accessory tube might be mistaken for an ovarian pregnancy, especially if the ovary of the same side becomes extensively adherent and a normal tube is found in addition to the gestation sac. Similar errors may be made in the case of a fertilized ovum developing in an accessory tubal canal or upon the tubal fimbriæ. In the latter instance the ovary may become so involved in the wall of the gestation sac that it might easily be regarded as the primary seat of the developing ovum.

A tubal gestation that easily escapes into the broad ligament and continues to grow may become so intimately attached to the ovary that the latter cannot be distinguished as a distinct structure by the naked eye.

If in these cases the Fallopian tube can be traced upon the anterior surface of the tumor the diagnosis of ovarian pregnancy is frequently made. Webster has seen one such case, in which the greatly thinned and stretched ovary could be detected by microscopical examination over an area of about two square inches, forming a considerable portion of the posterior wall of the gestation sac. By a careful study of a length of Fallopian tube of four inches that was stretched over the upper surface of the sac the place and extent of the ruptured area in the tube could be determined. Van Tuessenbroek's specimen was undoubtedly topographically ovarian, but Webster believes it is questionable whether it was primarily ovarian. This thought occurred to Professor Leopold at the Congress, for he suggested that the gestation might have begun in the tubal fimbriæ. This criticism would appear to be well grounded, for the position of the fimbriated extremity of the tube has not been accounted for satisfactorily by van Tuessenbroek. The outer end of the fimbriæ, Webster has found, may bear several relations to the ovary. It may not reach the ovary; sometimes it just touches the ovary; its very tip may be embedded in the ovary; a considerable extent of the fimbriæ may be lying against or adherent to the ovary; there may be a break in the continuity of the fimbriæ, so that a small outer portion may lie close to the ovary, detached from the rest, and easily overlooked. Again, it cannot be denied that this ovum may have developed in some of the Müllerian tissue, which Marchand and Williams have shown may be caught in early life in the ovarian tissue. In her earlier reports van Tuessenbroek described decidua in the

Graafian follicle surrounding the ovum. In her final report she said her first report was wrong, and that the supposed decidual cells were really cells of the corpus luteum. The cells in question were somewhat necrosed and difficult to define, and Webster is surprised that van Tuessenbroek committed herself to the statement that no decidual cells were present, for it is difficult, from the varied appearances presented by degenerating cells in uterine and tubal pregnancies, to be positive in such a differential diagnosis. Webster is of the opinion that an ovum can only develop from tissues derived from the Müllerian tract, portions of which may be found attached to the ovary, to which is limited the genetic reaction. Only tissues possessing the genetic reaction are capable of forming decidual tissue.

As to the last statement, there must still be a question, for Webster has not as yet fully proved his theory. Certainly his argument is strong—so strong, indeed, that every scientific man must look askance at any report of an ovarian pregnancy which is not based upon a most exhaustive histological study.

Etiology of Ectopic Pregnancy. While the study of the etiology of ectopic pregnancy can have no bearing upon the immediate treatment of this condition, its careful consideration may be of value in prophylaxis. The following paper is therefore of practical as well as of scientific value :

R. Glitsch¹ reviews the literature upon the etiology of tubal pregnancy, and includes 45 cases which were operated upon in Dr. Walcher's service at the Royal School of Midwifery at Stuttgart.

Before considering his own cases Glitsch reviews the opinions of various other writers.

Virchow, as early as 1856, considered perimetritic adhesions a cause for ectopic pregnancy. A. Martin, in 1881, said that a particular cause for this condition was some obstruction to the passage of the fertilized ovum through the tube on account of peritonitis and parametritis.

Wyder, 1886, agrees with this statement, and in 1891 reported a series of six cases of extra-uterine pregnancy, in three of which he found inflammatory alterations in the perimetrium.

Fritsch, 1891-1892, says, "Pelvic peritonitis is the most important etiological factor in extra-uterine pregnancy."

Von Schrenck, 1893, in a collection of 610 cases of extra-uterine foetation, has determined the etiological factor in 93. There was : External transmigration of the ovum 11 times, or 11.8 per cent. ; internal transmigration once ; twin pregnancy, three times ; adhesions and peritoneal bands, 65 times, or 70 per cent. ; fibromyoma in tube

¹ "Zur Aetiologie der Tubenschwangerschaft," Archiv f. Gyn., Band lx., Heft 3.

once ; and diverticula in tube wall, 3 times Von Schrenck, from the fact that among 323 of his cases 275 were multipara, concludes that perimetritic adhesions play the chief rôle, and that these arise, as a rule, during the puerperium.

Engstrom concludes from a study of ten cases that frequently an inflammatory alteration of the tubal mucosa (salpingitis catarrhalis) is the cause of extra-uterine pregnancy.

Schauta, 1896, in his text-book gives catarrhal alterations in the tubal mucosa, chiefly gonorrhœal, as the predisposing cause of ectopic gestation.

Dührssen, 1897, believes endosalpingitic alteration to be the important factor in tubal pregnancy. He has investigated the cause in a series of 35 cases, with the following result : 4 cases, no abnormality beyond the tubal gestation ; 1 case, accessory ostia in the opposite tube ; 1 case, ovarian cyst in the opposite tube ; 1 case, ovarian cyst in the pregnant tube ; 3 cases, only uterine disease ; 1 case, atrophy of the affected tube ; and 24 cases, or 68.7 per cent., tubal disease which had already existed before the operation.

The non-pregnant tube showed in 10 cases hydrosalpinx, in 2 cases pyosalpinx, in 2 others perisalpingitis chronica, and in 3 more salpingitis chronica.

Küstner, 1899, says that inflammatory affections of the tube, especially of the mucosa, is the most plausible etiological factor in tubal pregnancies. The experiments upon animals by Küstner, Mandl, and Schmidt (see below) bear out this theory.

A. Martin, in his text-book, 1895, leaves the question of the influence of inflammatory alterations in the tube upon the production of tubal pregnancy in doubt, although in an earlier work, 1893, he said, "I see in pelvic peritonitis not the cause, but the almost physiological consequence of ectopic pregnancy."

Other authors mention rarer causes for extra-uterine gestation. Thus Freund and Abel have described cases as resulting from a persistent foetal type of tube. Patellani believes that the frequency of malformations of the genital apparatus and of ectopic pregnancies go hand-in-hand. A. Martin, Kreisch, von Schrenck, and Küstner have written on the peritoneal transmigration of the ovum as a causal factor, and Wyder has noted a case of uterine transmigration. Beck, Breslau, Leopold, and Olshausen have ascribed cases of tubal pregnancy to mucous polyps of the tube ; Petit, Roth, Olshausen, and Webster to tumors in the tubal wall or in its region ; von Schrenck and C. Goebel to diverticula in the tubal wall ; Dührssen to atrophy of the tube.

From the foregoing it is apparent that most authors agree that the chief factor in the etiology of ectopic gestation is inflammatory altera-

tions in the pelvic organs, whether it be pelvic peritonitis, perisalpingitis, or endosalpingitis. Since Noeggerath called attention to the dangers of gonorrhœa in women many of the inflammatory affections of the endometrium, tube, and pelvic peritoneum have been laid to the account of the gonococcus of Neisser. For this view the brilliant researches of Bumm and Wertheim are responsible. From the investigations of the past ten years it is the general opinion that gonorrhœal infection takes wide precedence over puerperal and tubercular infections. Kleinhans says, in Veit's *Handbuch der Gynäkologie*, that in the examination of the contents of purulent accumulations in the tube that are not sterile the gonococcus is the predominating micro-organism, but that all other pyogenic varieties (streptococcus, staphylococcus, diplococcus pneumoniae, tubercle bacilli) are also found.

Martin and Orthman, in a study of 376 cases from different authors, found 161 positive bacteriological results. Of these 76 were pure gonococci; 75 of other bacteria, of which 50 were streptococci and staphylococci. Wertheim recently (1899) says the gonococcus is unrecognizable in their involution forms by the microscope, and to this failure he ascribes the large percentage of negative findings in pyosalpinx.

From this record it appears unquestioned that gonorrhœa plays an important part in the etiology of tubal pregnancy, either by producing an endosalpingitis which obstructs the tubal lumen, or through peritoneal bands and adhesions which compress the tubal canal.

Schauta says that a catarrhal process of the uterus seldom encroaches equally upon both tubes; as a rule, one is involved a long time before the other. From the gradual ascending character of the affection, first the isthmus, then the ampulla, and finally the fimbriated extremity is involved. When one tube is so far invaded that its ampulla is obstructed the other may show slight, often almost imperceptible alterations, consisting of a swelling of the median portions of the tubal mucosa. If both tubes are seriously involved pregnancy is not likely to occur, for then the ampullae are usually closed, or if they are not closed their mucous membrane is so diseased that it is quite as incapable of nourishing a developing ovum as is a chronically inflamed uterine mucosa.

Schauta also believes that in catarrhal swelling of the tubal mucosa, with an open, fimbriated extremity, a fecundated ovum in its passage either directly through the tube, or after external transmigration, may be detained in the ampulla because the flow of the stream of serum from the peritoneum into the uterus is broken, and the cilia cannot act against the stasis at the isthmus. Dührssen says it is settled that the most frequent cause of tubal pregnancy is tubal gonorrhœa.

In agreement with the last-named authors, Glitsch believes that the fact recorded by Ahlfeld, of having seen but one case of tubal preg-

nancy in twelve years' experience in Giessen and Marburg, depends upon the infrequency of gonorrhœa in that region. If gonorrhœa plays such a rôle in simple ectopic gestation it is probable that it plays a similar part in the causation of repeated ectopic pregnancies.

In the 43 cases of tubal pregnancy that Glitsch reports the findings are put down as follows: 11 times, kolpitis purulenta; 19 times, inflammatory alterations of the pregnant tube or of the other side (endosalpingitis, perisalpingitis, hydrosalpinx, pyosalpinx); 8 times, inflammatory adhesions to the pelvic organs; 4 times, cystic degeneration of the ovary; and 3 times, posterior position of uterus—*retro-versio-flexio-uteri*.

In 24 cases the adnexa of the opposite side were normal. Among the 45 patients 6 were nullipara; 12 had had one normal labor; and 25 were multiparæ. There were 9 in whom one or more of the preceding pregnancies or the directly preceding pregnancy had ended in abortion or miscarriage. In the entire number of these cases there was no normal pregnancy between the abortion and the extra-uterine foetation. The time-interval between the preceding pregnancy in those cases not interrupted by abortion or miscarriage varied between six months and eleven years.

In one case the patient had had two children, and then fifteen years had elapsed, although the first two conceptions occurred within a year of one another. Six times the tubal pregnancy occurred in multiparæ, one of whom had been married fifteen years without conception.

With regard to the pathological study of his cases, he agrees with Fritsch and Martin that it throws but little light upon this subject. If the structural alterations are very extensive it may be accepted that they are closely associated with the production of the atypical pregnancy. It is not his purpose to go into all the fine and complicated questions in the pathological changes of the tube, and especially of its mucosa, but rather from a clinical stand-point to draw conclusions as to the etiology of extra-uterine pregnancy. In 6 of his 45 cases there was no history and no discoverable lesions that threw any light upon the etiology.

As to perimetritic alterations we can draw no conclusions unless the length of time that they have existed is determined, for there are doubtless cases in which they are secondary to the irritation produced by the growing ovum. We see, on the other hand, as in the 6 cases above referred to, that sometimes this inflammatory reaction is entirely absent. More important is the history of a previous leucorrhœa, but even paramount to this is the history of an attack of acute inflammation in the region of the tube. Among his cases he found in 8 instances inflammatory alterations in the tube which resulted in a distinct thickening of that tube and the closure of the fimbriæ. In 1 case there occurred

near the tubal pregnancy a pyosalpinx. In 2 cases there was a right-angled kinking of the tube fixed by adhesions. In 3 cases extensive inflammatory alterations were found. As to the determination of tubal lesions, a pelvic examination is of no value except when gross lesions are present, for Dührssen has shown that a tube may appear normal and yet the microscopical examination demonstrates a chronic salpingitis.

Reviewing his cases as a whole, Glitsch finds that in 9 gonorrhœa was present. In 3 cases there was puerperal infection, probably gonorrhœal. Twice there was an external transmigration of the ovum.

From the observations of von Mandl and Schmidt we know that a plain mechanical closure of the tube is not a sufficient cause for tubal pregnancy. Their experiments apparently show that a normal mucosa does not furnish a favorable site for the embedding of a fecundated ovum. In the presence of inflammatory alterations the tubal mucosa may become swollen, and thus obstruct the lumen; and, besides this factor, the loss of the ciliated tube may favor the lodgement of the ovum in the tube. In the etiology of tubal pregnancy there are, therefore, a number of factors, some of which may be regarded as predisposing and others as exciting. Glitsch concludes his paper with the following summary:

1. The cause of ectopic gestation is not attributable to one factor alone. Usually there exists a predisposition to the affection, born or acquired, upon the basis of which the exciting cause produces an abnormal embedding of the ovum.

2. Inflammatory alteration in the tube and its neighboring organs is the most prominent cause of tubal pregnancy. All other causes (closure of the tube lumen through kinking, polyps, tumors, external and internal transmigration of the ovum) are much less frequent and come scarcely into consideration in the study of the enormously increasing number of extra-uterine pregnancies.

3. The inflammatory alterations are almost always of infectious origin.

4. By far the most frequent micro-organism, especially in salpingitis purulenta, is the gonococcus.

5. Based upon clinical experience, as well as upon the literature of the subject, the final conclusion is justified that in the greater number of cases gonorrhœa, either of previous origin or present at the time of impregnation in the tube or its environs, is usually responsible for ectopic pregnancy.

CHRONIC ENDOMETRITIS.

There is, perhaps, no disease of the uterus and its appendages more difficult to cure than chronic endometritis. This is due to the persistence of the infectious organism, which is usually the gonococcus.

Menge,¹ of Leipzig, has made a very thorough review of this subject and has suggested lines of treatment which, I believe, will be of value if carefully followed. His article may be summarized under the following heads :

1. The need of a special treatment for chronic endometritis.
2. Why chronic endometritis must be treated by the general practitioner.
3. Varieties of chronic endometritis.
4. Diagnosis.
5. General treatment.
6. Varieties of local treatment and a discussion of them.
7. Relative merits of the caustics that have been used in the past.
8. Discussion of the problem of the application of caustics to the uterine mucosa.
9. Specula.
10. Menge's applicator.
11. Menge's technique of cauterization.
12. Results of intra-uterine formalin cauterization.
13. Contraindications.

The Need of a Special Treatment for Chronic Endometritis.

Should every case of endometritis be subjected to a special line of treatment? For those cases in which the disease is well marked clinically, and the woman becomes seriously affected, physically and psychically, there, evidently, an efficient therapy is highly desirable. But many patients the victims of endometritis never exhibit characteristic symptoms. These are the cases of "unsuspected endometritis." Instead of complaining of metrorrhagia, menorrhagia, and leucorrhœa, they suffer from painful nervous sensations in the lower abdomen, which may gradually awaken in them the idea that they have "womb trouble."

These are the instances in which functional neurosis is complicated by a slight non-infectious uterine catarrh whose symptoms remain latent. The question of the advisability of treatment is more difficult to answer.

Cases of "unsuspected endometritis" may be divided into two classes: (1) those in which the psychical condition is predominant; (2) those in which the psychical condition is normal.

In the first division the patients may have had a minimum of suffering for a long time, and there has gradually come about a psychical alteration, which, in a highly gifted neuropathic woman, is often so portentous that the first hint from a physician that her genital organs are diseased may occupy her mind continually and give rise to grave psychic disturbance. Under such circumstances some plan of treatment is im-

¹ Die Therapie der Chronischen Endometritis in der Allgemeinen Praxis, Archiv f. Gynäkologie, Band lxxiii., Heft 1 und 2.

perative. As local treatment would convey an unwished-for nervous impression, that is out of the question. Fortunately, this class of cases is usually dependent upon constitutional causes, and a local treatment is not demanded.

Even when the cases of the second class, with full mental equilibrium, present latent symptoms, constitutional treatment may suffice, but should the affection prove troublesome, local therapy should be added.

In Menge's opinion all cases of chronic endometritis, of whatever nature and whatever intensity, demand general treatment. And all these cases demand local treatment when it is apparent that such measures will cause no psychical trauma.

Why Chronic Endometritis Must Be Treated by the General Practitioner. In the management of endometritis the specialist is not alone concerned. It is only in large towns where specialism is general that these cases come under the care of a gynecologist. In the country and in the smaller towns, where, perhaps, with the exception of the gonorrhœal forms, endometritis is just as frequent, these patients will consult the general practitioner.

B. S. Schultze says that the local treatment of chronic endometritis cannot be well carried out by the general practitioner. Menge thinks otherwise, and with Säger believes that a local therapy should be conducted by the general practitioner. I have above blamed the specialist for neglecting so often the general treatment. On the other hand, the general practitioner is often open to censure for neglecting a suitable local treatment, for they are often satisfied, without even a gynecological examination, to order a douche, medicated or plain, which may be of value, but frequently is quite useless or even harmful.

Varieties of Endometritis. Menge adopts the following classification of chronic endometritis:

ENDOMETRITIS CHRONICA HÆMORRHAGICA.

1. Connected with parturition.
 - a. Endometritis post-partum maturum.
 - b. Endometritis post-abortum.
2. Not connected with parturition.
 - a. Bleeding in adolescence (chlorosis).
 - b. Bleeding during menstrual life (1. With leucorrhœa, anæmia, and nutritive disturbance. 2. Without leucorrhœa, endometritis fungosa (Ols-hausen). Mostly preclimacteric.
 - c. Bleeding at menopause. Endometritis senilis atrophica uteri.

ENDOMETRITIS CHRONICA HYPERSECRETARIA.

1. Gonorrhœal.
 - a. Endometritis chronica gonorrhœica.
 - b. Endometritis chronica post-gonorrhœica.
2. Not gonorrhœal.
 - a. Leucorrhœa in adolescence (chlorosis).
 - b. Leucorrhœa during menstrual life (anæmia and nutritive disturbances).
 - c. Leucorrhœa in the menopause (endometritis senilis atrophica uteri).

In an earlier work, based upon bacteriological grounds, Menge has already made the observation that, leaving out of the question endometritis dependent upon general nutritive disturbances, the greater number of cases of endometritis with simple hypersecretion, also the majority of those with hypersecretion and menorrhagia, are of gonorrhœal origin.

Chronic endometritis is also extraordinarily often associated with functional neurosis, especially the lighter grades of hysteria. Very often this is a mere coincidence, as both diseases are widely prevalent among women. But Menge has already pointed out how chronic inflammatory diseases of the uterine mucosa, through its intensity, stubbornness, or long duration, may act as a psychical trauma and induce in a previously sound woman hysteria, or the same causes may develop a latent hysteria. Moreover, hysteria, when associated with catarrhal disturbances of the intestines, may secondarily, through anæmia and malnutrition, form the basis for endometritis.

Diagnosis of Endometritis. For the diagnosis of endometritis, the general practitioner must chiefly rely upon a careful history, with reference to the probable origin, the course, the duration, and the prominent local symptoms of the affection.

Bimanual palpation, inspection of the portio vaginalis, and bacteriological examination of the discharges are to be painstakingly carried out.

In cases of suspected gonorrhœal origin, especial attention must be paid to the urethral mucosa and the vulvovaginal glands.

The value of the sound in diagnosing endometritis is questionable. Menge himself found the results quite variable. He found that the healthy mucosa might be sensitive, and that an unhealthy one might be insensitive. The tendency to bleed is a sign of no significant worth. Likewise pelvic pain and dysmenorrhœa are too variable in their portent to be of value.

General Treatment. Under the general treatment of chronic endometritis all those regulations which we habitually employ in caring for chronic alterations of the mucosa in other organs should be observed. Thus, patients should have a restricted diet poor in alcohol; they must be given general massage and directed to take regular exercise, and their intestines should be regulated. To this may be added suitable drugs. A personal impression upon the patient, winning their confidence, and thus effecting a sort of "suggestion," and that other master-stroke so successfully employed in neuropathic cases, viz.: separating the patient from her home and from her accustomed surroundings and pursuits, are to be encouraged.

VARIETIES OF LOCAL TREATMENT. By local therapy in chronic endometritis is meant a treatment applied to the entire uterine mucous

membrane. Whether the endometritis affects the cervical or the corporeal endometrium, or both, matters very little. All endometritis that is not gonorrhœal in origin is mostly confined to the corporeal endometrium. Cervical gonorrhœa is prevented at first from reaching the uterine body mucosa by the constriction of the internal os, but the spread of the infection usually occurs later through the tissues, or during a menstrual period, or after labor. From Wertheim's, Schultze's, Skutsch's, and his own investigations, Menge believes that local treatment of endometritis should never be confined to the cervix. Either one with particular prudence leaves untouched a part of the cervical mucosa, or recklessly penetrates into the corporeal cavity. In seeking for a local therapy satisfactory to the general practitioner the following requirements should be borne in mind :

1. A method valuable to all or to most forms. (For a general practitioner has neither time nor instruments to master more than one method.)

2. A method relatively free from danger.

3. A method relatively sure and prompt.

4. A method easily applied. (Without previous dilatation of the cervical canal, without assistance and in an aseptic manner during the practitioner's office hours.)

5. A method which permits the patient directly afterward or within a few minutes to go about.

The following are the local therapeutic measures which have been employed up to this time : 1. Hot vaginal douches, medicated or plain. 2. Tampons in the vaginal vault of ichthyol, boroglycerin, tannin, etc. 3. Scarification of the portio. 4. Cauterization of the cervical mucosa with the thermocautery. 5. Excision of the cervical mucosa. 6. Gauze tamponade of the uterine cavity. 7. Atmo- and zestocausis. 8. Abrasio mucosæ uteri. 9. Intra-uterine electrocausis. 10. Applications of chemicals to the mucosa. 11. Hysterectomy vaginalis.

Of these methods we may dismiss at once Nos. 4, 5 and 11, for these fall without the province of the general practitioner. Nos. 1, 2, 3, and 6 are too slow in results.

We have then to discuss abrasio mucosæ (curettage), electrocausis, atmo- and zestocausis, and the application of chemicals to the mucosa.

THE ELECTRO CAUSTIC is occasionally efficient, but its action is difficult to gauge, and it is nearly impossible to apply equally to every portion of the mucosa. Besides this, the apparatus is expensive, the technique is difficult to learn, hard to carry out aseptically, and if it is used too strong it may produce severe cicatricial stenosis.

ATMOCAUSIS AND ZESTOCAUSIS. The objections to this are the need of a reliable apparatus at a moderate cost ; the necessity of

assistance and some experience to determine the temperature and duration of the application. This treatment is especially good in endometritis senilis, and preclimacteric forms.

ABRASIO MUCOSÆ (CURETTAGE) is very popular with gynecologists, but it is not a suitable operation for the ordinary practitioner. To be properly performed, trained assistants, ether, asepsis, and a full dilatation of the cervical canal are necessary, and unless the operator has a skilful hand this method is dangerous.

Concerning curettage, Olshausen says: "Whoever performs curettage must, above all, have a delicate touch; almost nowhere in operative gynecology is this so important as in curettage. This is only gained by long experience, and I am of the opinion that abrasio mucosæ is not every man's task."

When, in cases suspected of malignant alterations, curettage for diagnostic purposes is required, then a competent gynecologist should be consulted.

MEDICINAL LOCAL TREATMENT. We come now to the consideration of the application of chemicals to the mucosa.

Among these are antiseptic intra-uterine douches, astringents, and caustics.

As for the douches, it is reasonable to suppose that only when the inflammation is quite superficial will any good be accomplished, and then more from their detergent and thermal than from any physico-chemical action.

Regarding the use of astringents, here again we find an action that is at best confined to the superficial layers. Long-continued applications may do good, but this is unsatisfactory to the physician and may be demoralizing to the patient.

A chemical treatment in chronic endometritis must, in order to be satisfactory, destroy the diseased portion of the mucosa entirely. Menge has found that even in the worst chronic cases of endometritis the very depths of the mucous membrane, that part directly adjoining the muscular layer, are nearly always healthy. So that when the overlying part is destroyed by chemical processes a new endometrium may be regenerated from the remaining healthy portions. This regeneration is only possible when the exciting cause of the disease is either eliminated or held in abeyance.

RELATIVE MERITS OF VARIOUS CAUSTICS. The following caustics have been employed in the chemical treatment of the mucosa: Tincture of iodine, cupric sulphate, carbol-alcohol, zinc chlorate, liquid ferri sesquichloride, nitric acid, and argentic nitrate. Of these tincture of iodine and liquid ferri sesquichloride are inefficient; carbol-alcohol is too likely to be absorbed; nitric acid is too strong; nitrate of silver

is too apt to produce stenosis and is not very efficient, while cupric sulphate is very active in causing uterine colic. Chlorate of zinc has been the caustic most frequently used, and it has been considered the best. It is usually employed in a 50 per cent. solution, and in this strength it gives remarkable results. It has many disadvantages, however, which are not possessed by another chemical used first by von Winkel and later by Menge as an intra-uterine caustic, viz.: formalin. The objections to the chlorate of zinc as a caustic are as follows:

1. The 50 per cent. solution, which is the only strength that is efficient, cauterizes too deeply, and is very prone to cause stenosis.

2. This chemical causes dense, tough sloughs in which the zinc is held as an albuminate. Menge has proved by experiments that such sloughs are excellent culture media for bacterial growths.

3. The unchanged chlorate of zinc is a weak antiseptic. Thus Menge has had anthrax spores live in a 50 per cent. solution for twelve hours. Paul and Krönig have exposed anthrax spores for ten days in a 15 per cent. solution, and then found them viable, and R. Koch has done the same for thirty days in a 5 per cent. solution.

4. When the sloughs resulting from chlorate of zinc cauterization come away from the uterine walls, bleeding is very apt to occur.

5. Chlorate of zinc cauterization very often causes severe colic.

Formalin in a 50 per cent. solution, or the formaldehyde of Scheering in full strength, does not cauterize so deeply as the chlorate of zinc.

The sloughs produced are neither so thick nor so tough, and Menge has never seen severe hemorrhage follow their separation. There is no danger of stenosis following cauterization with formalin, and no absorption of the drug from the uterine canal has ever been reported.

It is a powerful disinfectant, as will be shown later on, and scarcely ever produces more than a very slight colic, which does not seem to incommode the patient.

Mode of Application of Caustics to the Uterine Mucosa. Caustic substances have been applied to the uterine canal moulded into the form of pencils, upon gauze-packs and in solution. The caustic pencils are difficult to introduce through an undilated cervix and in an aseptic manner without breaking them. Besides they are prone to produce a stronger or a weaker effect than is desired.

About the same objections obtain in the use of gauze impregnated with the chemical.

Solutions of caustic are more to be desired than either of the above, for a solution can be applied to every nook and cranny of the endometrium, but they present several difficulties in their application which must be overcome.

All forms of intra-uterine syringes, canulae, etc., are objectionable for two reasons :

1. The likelihood of injecting more solution than is necessary into the uterus, causing an overflow into the tubes and peritoneal cavity.
2. The difficulty in their sterilization and of carrying out the injection in an aseptic manner.

The observations of Doederlein, Zweifel, Hoffmeier, and Menge seem to prove that in the employment of intra-uterine injections at the moment of the injection the barrel of the instrument may be strongly grasped at the internal os and the excess of fluid injected escape through the Fallopian tubes. This result seems nearly independent of the amount of fluid injected, and is much more likely to result when uterine colic follows the injection, for uterine colic is a symptom of uterine contraction, and the experiments of Menge prove that active contraction of the uterus is the chief factor in the passage of the caustic fluid into the tubes.

The effect of an overflow of caustic solution into the peritoneal cavity is a slight peritonitis caused by the chemical irritation. Schwartz says that this is never septic when asepsis has been observed in the use of the instrument. Granting this as true the resultant scars and the cicatricial bands may cause a partial or entire closure of the tube and lead to sterility, extra-uterine gestation, hydrosalpinx, and perioöphoritic adhesions.

Then, too, the fact must not be ignored that there exists in the literature the report of twenty cases of death from sepsis following intra-uterine injections, and unquestionably only isolated cases of this sort have been recorded.

Another method of intra-uterine cauterization is by means of a sound carrying cotton which has been soaked in the caustic solution. Hoffmeier objects that when a sound armed in this way is carried through the internal os with cervix undilated, most of the caustic will be already squeezed out by the time the sound reaches the uterine cavity. That this is not true Menge demonstrated repeatedly by his own experiments upon extirpated uteri by means of a caustic solution colored with methyl blue ; again, this is disproved by the appearance of uterine colic after the employment of certain caustics in this manner, and again by the therapeutic results of this mode of treatment.

Specula. For intra-uterine cauterization a good exposure of the portio vaginalis is absolutely essential. Not every speculum is suitable for this employment.

It must be capable of sterilization by boiling.

It must be rather short bladed, so that the cervix is not pushed away from the introitus ; but in spite of its shortness it must effect quickly

and certainly, even in a capacious vagina, a perfect exposure of the vaginal cervix.

The mouth of the speculum must have considerable width, so as to allow free range of motion to the handle of the sound during the intra-uterine manipulations.

The speculum must be easy to introduce and without pain to the patient.

Finally, the speculum should be self-retaining. The best specula for the purpose are the Nelaton and the Neugebauer models. Cylindrical specula are entirely unsuitable, and the Cusco two-billed speculum is too narrow at the mouth. Of the two, Menge believes the Nelaton to be the most suitable for the general practitioner.

Uterine Applicators. The requirements of a sound best adapted for intra-uterine cauterization are as follows :

It must be easy to sterilize, made of non-corrodable metal, and cheap, so that even the general practitioner may have a number on hand ready for use.

The sound must be flexible and yielding—not soft enough to be brittle, nor yielding enough to prevent one's giving it a definite direction.

The diameter of the sound must be such that it can be passed wrapped with cotton through an undilated cervix, and yet must be large enough to overlies a certain surface and carry a sufficient amount of caustic fluid in its wadding.

It must be armed with cotton to its tip, so as to reach the fundal portions of the endometrium with the solution.

The surface of the instrument must be smooth and gradually tapering toward the end to allow easy removal of the cotton.

In making the application the sound must be slightly curved to correspond to the usual anteflexion of the uterus.

Neither the Playfair sound; the Oberman wooden sounds; the bamboo sound of Lott; the feather sound of Schroeder, nor the American silver sound answer all of these requirements.

Menge has had made by Schaedel, of Leipzig, a sound cut out of hard rubber, which has answered all demands and has served him well for a number of years. This instrument may be boiled without losing its shape, if the precaution is taken to place it upon a flat surface.

Menge's own method for keeping the sounds ready prepared for aseptic cauterization of the endometrium is as follows: The sound must be so accurately wound with the cotton that there is no gross unevenness which would render difficult the introduction of the instrument. To arm the sound one pulls a strip of cotton into a thin

transparent film,¹ one end of which is fixed to the tip of the sound moistened in formalin solution by the thumb and the first finger of the left hand, while the right hand holds the handle and quickly revolves it, so that the rounded end of the sound is covered. Then the left hand secures the free end of the strip and holds it toward the handle of the sound at an acute angle with its long axis, so that in turning the sound the cotton strip is wound in loose serpentine folds upon the instrument. The cotton thus wound loosely is pressed fast to the sound by revolving the instrument with the right hand with a screw motion between the finger and thumb of the left hand. In such a manner may the sound be wrapped so thinly and so uniformly that the resulting increase in thickness is, after all, very little, and it may be readily passed through the cervical canal. When one has prepared some twelve sounds after this fashion they are placed point downward in a cylindrical glass jar of 400 c.cm. capacity filled 7 cm. high with a 30 per cent. formalin solution, or with the formaldehyde of Scheering (undiluted). The vessel is provided with a ground-glass stopper, which prevents the vapor of the formalin from escaping. The part of the sound immersed in the formalin solution, as well as the handle exposed to the formalin vapor, are thus thoroughly disinfected. Experimentally, Menge has found that anthrax spores dried on granite and exposed in the top of the vessel are killed in two hours. The sounds are usually made ready after one office hour for the next, so that if twelve sounds are prepared the practitioner is ready to treat four to six patients, taking it for granted he uses two to three sticks for each patient, as Menge is in the habit of doing. Two sounds at least are necessary, for the first one is withdrawn covered with mucous, and this obviously interferes somewhat with the action of the caustic.

Menge's Technique of Cauterization. Cauterization is never performed directly after a combined examination, for one does not disinfect the hands thoroughly before an ordinary gynecological examination, and thus bacteria might be deposited on the external os and then carried inside by the applicator. Two or three days after the bimanual examination the first intra-uterine cauterization may be performed. In the meantime the patient avoids coitus, vaginal douches, and washing of the vulva. The vagina frees itself of pathogenic germs in several days.

A Nelaton speculum is freshly boiled and inserted into the vagina without any disinfection of the external genitals, which at most harbor only harmless or weak pathogenic organisms. To one who is experienced this manœuvre is accomplished very easily without touching the speculum blades. If this soiling of the blades is unavoidable, then

¹ The instrument is flattened on the sides.

asepsis can be preserved by the use of rubber gloves, which have been boiled and then preserved in sublimate solution.

After exposure of the cervix the portio vaginalis is washed off with a pledget of cotton soaked in bichloride solution and held on a forceps. This is unnecessary, bacteriologically, but it is a good plan, for it prevents weakening of the caustic by vaginal secretion which may be spread upon the os, or by mucus from the portio vaginalis. The anterior lip of the cervix is caught with a sterilized tenaculum. The uterus is steadied by the tenaculum, grasped in the left hand, which rests upon the rim of the speculum, so that no undue motion which might cause discomfort for the patient can result during the intra-uterine manipulations. The prepared sounds may be taken one after another from the formalin jar alongside and passed under full view directly into the cervical canal.

The first sound should be so rotated and twisted in the cervical canal as to iron out the cervical mucosa and clear away the mucus. With the second and third sound every portion of the endometrium should be treated by bearing in mind the curve of the instrument and giving the point of the sound a definite direction. After these manipulations there is occasionally slight bleeding, but this is of no consequence.

In order that any blood mixed with the caustic solution collecting in the speculum should not irritate the vaginal walls, it should be soaked up by cotton pledgets. Should the formalin come in contact with the vagina or the external genitals, thorough washing with pure cold water or with dilute sublimate solution will nearly always prevent painful burns. When the portio vaginalis is eroded the same should be touched with a 50 per cent. formalin solution or with Scheering's original preparations.

After the cauterization a strip of plain or iodoform gauze is placed from the outer os into the vagina, in order to hold the caustic for a time after the cauterization, also to hinder blood-stained secretion from flowing out of the vagina. This gauze must be removed at the end of twenty-four hours. Directly after the cauterization the patient remains for five minutes in the dorsal position, and then she is dismissed, with orders not to pay any attention during the next few days to a copious blood-tinged discharge. For three days vaginal douches may be taken, but they are not necessary.

With regard to the frequency of repeating the caustic treatment, Menge agrees with Sanger that it should not be too soon. There are three changes following cauterization, viz.: slough formation, slough expulsion, and regeneration of the mucosa. In the first and second periods it is wise to withhold further local treatment and await results. But if after the end of the second period the suffering is not amelior-

ated then cauterization is indicated at once. Thus it may be repeated in five to eight days without awaiting the regeneration of the mucosa. In this Menge differs with Sanger, but his opinion is the result of seven years' experience.

Results of Intra-uterine Formalin Cauterization. This treatment is very efficient in endometritis post-partum and endometritis post-abortionum. A single cauterization is usually enough. Perhaps its most brilliant results are seen here. If the treatment is ineffectual the diagnosis must be questioned, and the uterus should be dilated and explored with the fingers.

Retained placenta, with its slightly enlarged uterus and patulous os, is usually easy to diagnose from endometritis post-partum and endometritis post-abortionum. The practising physician should not forget the possibility of retained placenta, nor that of a malignant new-growth.

This treatment influences beneficently also those forms of endometritis chronica hypersecretoria which are to be attributed to a gonorrhoeal infection of the mucosa. The endometritis post-gonorrhoeica will often be cured by several well-performed intra-uterine cauterizations.

Chronic Gonorrhoeal Endometritis demands on the average a somewhat longer local treatment. Only in chronic and uncomplicated cases is this treatment applicable. It must not be undertaken at the earliest under three months after the initial infection.

In the treatment of chronic gonorrhoeal endometritis the associate treatment of the affected husband must not be forgotten.

In endometritis chronica hypersecretoria dependent upon puerperal infection the treatment is as efficient as in endometritis post-gonorrhoeica. The forms of endometritis dependent upon general nutritive disturbances as chlorosis are not influenced so much by this local treatment as by general treatment, although in such cases the combination of the two is often very effective. This combined treatment also gives brilliant results in the *endometritis fungosa* of Olshausen. In the latter Menge has been in the habit of using a 50 per cent. formalin solution.

When evidences of endometritis fungosa exist before or during the menopause, one should before resorting to intra-uterine cauterization have performed a diagnostic curettage, for in these cases the possibility of malignant infections must be held in mind. Menge says he is not enthusiastic over the results of his method in endometritis senilis, but he knows of no better treatment in this condition.

Contraindications to Intra-uterine Formalin Cauterization. Menge observes the following conditions: pregnancy—intra-uterine or extra-uterine; uncomplicated acute and subacute gonorrhoea; complicated chronic gonorrhoea; submucous myoma; retained placenta; malignant growths, and menstruation.

GONORRHOEAL PYOSALPINX.

Conservative Treatment. The following full consideration of the medical treatment of tubal gonorrhœa is most interesting and suggestive :

While Krönig may possibly take too conservative a stand in the treatment of gonorrhœal pus tubes, his careful consideration of every detail of the pathology, operative and post-operative results in these cases, demands the most considerate study by every physician and surgeon who desires to deal conservatively and yet judiciously with his patients.

Krönig¹ has investigated the clinical course of gonorrhœa of the tubes and pelvic peritoneum when treated purely by the expectant plan. He deduces from his statistics arguments which favor conservatism, and he contrasts the ratio of sterility following gonorrhœa of the tubes and peritoneum with the ratio of sterility following infection with gonococci of the endometrium in early parturition.

In former times it was the custom in the Leipzig clinic, as elsewhere, to submit gonorrhœal adnexal disease to the knife and to remove all macroscopically diseased parts.

At first the results of such treatment seemed good, for the patient was relieved of her suffering for the time as by a master-stroke. However, when these patients were examined before dismissal painful stump exudates were often found. Sometimes these would be absorbed, but in the majority of cases when the woman again took up the duties of active life her attacks of pain, etc., recurred. To obviate these painful stump exudates better technique for the operation of salpingectomy was devised, as, for instance, removing the tube from the uterine cornu by means of a keel-shaped incision. This procedure has not been of much avail in gonorrhœal cases in direct contrast to the healthy stumps following extirpation of pregnant tubes, and it is obvious, therefore, that the fault lies not with the manner in which the tube is removed.

Wertheim first recognized that gonorrhœa affected not only the tubes but also the myometrium of the uterus, the ovaries, and the pelvic peritoneum ; so that sequelæ of salpingectomy and salpingo-oöphorectomy in gonorrhœal disease is not to be attributed to secondary infection at the time of operation, but to a continuance of the gonorrhœal process. To overcome this completely extirpation of the uterus and adnexa has been advised. In older women near or at the climacterium such a course has excellent results ; but in younger women—and the disease in

¹ Zur Prognose der Ascendirten Gonorrhoe beim Weibe, Archiv f. Gynäk., Band lxxiii., Heft 1 und 2.

question is most frequently encountered in the young—such an operation produces the disastrous psychological trauma incident to castration.

Concerning the benefit of operative treatment of gonorrhœal adnexal disease in younger women Fritsch, Hegar, Martin, Winter, Landau, and others of large experience seem to agree.

Hegar affirms that the consequences of operation are not very good, and that frequently a well-performed salpingectomy will be followed by a recurrence of the inflammation.

Gusserow held that the indications for extirpation of the tubal sac depended particularly upon the intensity of the perimetritic suffering, for the removal of the sac did not always lead to a cessation of the pain.

Winter believes that only a percentage of cases are relieved by operation; another part are only made better, and a third, a not inconsiderable number, according to his ideas, the half, are either no better but may be worse.

A. Martin states that even when the temperature-curve shows a fully normal afebrile course, about the third week stump exudates may be found which at first cause no suffering, but later may become the source of renewed pain. This is a shadow upon the durable results, and will prejudice the value of the operation considerably.

Such discouraging results in operative treatment as those indicated above led Zweifel some time ago to treat all cases of gonorrhœal adnexal disease upon an expectant plan, so as to form a correct opinion of the course of an ascending gonorrhœal infection when not influenced by extirpation of any of the diseased areas.

The impetus for Krönig's work was a statement of Bumm, one of the first investigators in gonorrhœa of the female, which appeared in his recent article in Veit's *Handbuch*:

"The outlook for recovery, at least in what pertains to the ability for work and the capability of enjoyment, in gonorrhœa of the tubes has been, in my opinion, in the later times too unfavorably put down. Even in cases with large pyosalpinges and recurring attacks of pelvic peritonitis it may be emphasized to the 'eager-for-operation physician' that all is not yet lost, and, under suitable measures, healing up to a nearly painless condition very often occurs."

In order to test the correctness of Bumm's assertion, Krönig ordered some of the women with tubal gonorrhœa who had been treated expectantly by Zweifel back for a re-examination some four years after their discharge.

In order that he might not be accused of selecting the most favorable cases he took only women of the working-class. That there may be no question as to the correctness of the clinical diagnosis in his cases (for

they did not come to operation), Krönig recalls the following points which were observed in establishing the diagnosis :

1. The most certain indication of a tubal enlargement is a thickening of the isthmus of the tube at the tubo-uterine junction.

2. The affection is usually bilateral, if it is of gonorrhœal origin, not that the enlargements on either side are equal, but that they do exist on both sides.

3. There is usually a reddening of the ducts of Bartholin's glands and of the peri-urethral tissue and of the vaginal introitus, as described by Säger. (Unfortunately, in only a few of these cases was there any cover-slip examination for gonococci).

4. The history in gonorrhœal cases usually shows, shortly after marriage or childbirth, a purulent discharge, burning upon urination, dyspareunia, and attacks of pain, especially upon severe bodily exertion.

5. The fact that parametritis scarcely ever accompanies tubal disease of gonorrhœal origin.

Krönig believes that probably all of his cases were correctly diagnosed. Statistics taken by Zweifel show that in the last eight years the diagnosis before operation in the case of pelvic enlargements agreed with the condition found on opening the abdomen in all but about 8 per cent. of the cases, and this 8 per cent. was chiefly represented by attempts at differentiation between rapidly growing and cystic myomata, and between ovarian disease and extra-uterine pregnancy.

Krönig has reason to think, therefore, that all of his cases, which numbered thirty-eight, were truly gonorrhœal.

Zweifel's treatment may be tabulated as follows :

In the condition of severe pain and increasing pyrexia—

1. Rest in bed. This often relieves the patient at once.

2. Ice-bag to abdomen.

3. Active purgation, four to six stools daily. This usually is followed by a drop in the temperature.

4. After pain had been relieved, alternating daily tampons of ichthyol and vaginal douches at a temperature of 40° C.

5. Stypticin, 0.05 gramme, t. i. d., if there was much menorrhagia.

6. Fluid, laxative diet.

In the greater number of these cases there were in the beginning tumors the size of eggs on both sides and behind the uterus. After a few days of treatment there would be such a diminution in size as to lead one to question whether or not in the initial examination a mistake had been made. This phenomenon may be explained in two ways :

First, serous encapsulated intraperitoneal effusions usually accompany pyosalpinx.

Second, a pyosalpinx or an inflamed tube is often adherent to the

rectum or to the sigmoid flexure. This causes some obstruction of the bowel as a rule, and there may be an accumulation of fecal matter at this point. Between the actual enlargement of the tube itself and the serous intraperitoneal tumors or the adherent distended bowel it is well-nigh impossible at times to distinguish. Krönig's statistics may be thus condensed :

1. *Period of Treatment.* Twenty-seven cases in the hospital : 1, thirty-eight days ; 2, twenty-four and a half days ; 4, nine days ; 5, four days ; 1, two days ; 14, thirteen days ; average duration, 12.11 days.

Eleven cases in the dispensary averaged one week. The average length of dispensary treatment lasts no more than a week, for the women feel better then, and renew their occupations, thus having no time for the dispensary office hour.

2. *Immediate Result, with Respect to the Resumption of an Occupation :* 30 took up their occupation immediately ; 3 resumed their occupation after three to six weeks ; 4 were often incapacitated for labor ; 1 became a prostitute.

After the woman is dismissed from treatment the pain may return, especially if her work is arduous, but the recurring attacks are less severe than the first. Some of these patients return for treatment, others carry out for themselves the measures prescribed before.

3. *Need of Further Treatment :* 15 received no further treatment ; 9 were treated once again several months later ; 8 required dispensary treatment for a week after discharge ; 3 were treated for a year in the dispensary ; 2 were subsequently curetted on account of menorrhagia ; 1 was admitted several times to the hospital.

4. *Remote Results of Treatment as Indicated by Pelvic Examination.* It was not possible to examine all of the 38 cases when they were summoned three years after the first treatment, for sometimes the woman objected to an examination, especially when she was no longer suffering. But of the 24 cases re-examined in all of them some thickening of the tube and some enlargement near the uterus could be found.

In 12 the uterus was retroflexed, retroposed, and adherent. In 11 the uterus was anteflexed and anteposed and tolerably movable. In 1 the womb was anteflexed and retroposed. In but 1 case was the uterus entirely immovable.

None of these cases ever again became pregnant. The influence of gonorrhœal tubal disease on the fertility of the woman may be seen in one of Krönig's cases of a patient, aged thirty-one years, who had had up to her illness twelve normal pregnancies. She was sterile thereafter.

However, it is to be observed that in three years the result with regard to conception is not permanent sterility, for later the tube may completely heal and the woman may again bear children.

The unfavorable influence of tubal and adnexal gonorrhœa on the child-bearing function led Krönig to ask whether the invasion of the uterine cavity by the gonococcus has a similar effect.

According to the observations of Sängner, Bumm, Menge, and others the opportune time for the ascent of a cervical gonorrhœa to the endometrium is early parturition; and the overstepping of the bounds of the cervical canal may be the first stage of an ascending gonorrhœa, for at one bound the infection may pass from the uterine mucosa to the Fallopian tubes and the pelvic peritoneum. In order furthermore to contrast the effect of these parturient gonorrhœal infections with those produced by the streptococcus and with those occasioned by saprophytic organisms, Krönig has kept records of a series of cases of each sort observed by him for a period of five years.

In the gonorrhœal cases the diagnosis was made by withdrawing from the uterine cavity through a capillary tube some of the lochial discharge.

The number of women in the gonorrhœal series was 36. Of this number, in spite of numerous possibilities of conception, 13, or $33\frac{1}{3}$ per cent., have become sterile.

In 21 cases conception has occurred, and, furthermore, in all of them at least one pregnancy has been normal.

In 3 of the cases pregnancy only occurred after a lapse of five years, and in 2 cases after four years.

In 1 case an abscess formed in Douglas' cul-de-sac. This was punctured per vaginam. For the next four years the woman did not conceive, but at the end of that time she became pregnant, and since then has averaged one pregnancy a year.

Krönig collected 30 cases of saprophytic puerperal infection. In 25 cases pregnancy occurred. In 5 cases pregnancy did not take place; but 3 of the 5 were subsequently infected with gonorrhœa.

There were 46 cases of streptococci infection. In 36 pregnancy followed. In 10 it did not occur, but 2 of these were seldom exposed to the possibility of impregnation.

Thus we see that the prognosis with regard to sterility is graver after gonorrhœal puerperal infection than after one produced by the streptococcus or the saprophytic bacteria.

As to the question of mortality, in Krönig's 74 cases there were no deaths. Menge and Brose have both reported cases of pyosalpinges of gonorrhœal origin bursting into the free peritoneal cavity without loss of the patient. This bears out the opinion of Bumm that the gonorrhœal process never produces a direct danger to the patient.

Krönig's ideas as to treatment may be thus summarized:

1. Acute peritoneal symptoms in a case of gonorrhœal salpingitis should not be an indication for operation.

2. Even the larger gonorrhœal pus tubes may, under appropriate general and local measures, be dried up and the suffering therefrom greatly ameliorated.

3. Vaginal puncture for the evacuation of pelvic abscesses is a conservative procedure and eminently justifiable.

4. If, under conservative treatment the suffering becomes worse, operation may then be demanded, but it must be remembered that this procedure is not sure to relieve the patient of suffering.

5. The best prognosis is in women at or near the menopause, in whom the uterus, tubes, and ovaries may be removed.

6. In women at the height or the beginning of the child-bearing period, castration should never be considered, and, as an incomplete operation is so unsatisfactory, and the treatment as outlined by Krönig is certainly attended with success in many cases, they should be given the benefit of conservatism.

While I may not be ready to take so ultra a conservative plan as Krönig's, his article nevertheless should be carefully considered, and in suitable cases faithfully carried out. This author's work has always been careful, painstaking, and conscientious, and his views should be given the most respectful consideration.

RESULTS OF CONSERVATIVE OPERATIONS UPON THE OVARIES AND TUBES.

F. Henrotin,¹ as a result of experience with conservative operations upon the ovaries and tubes, reaches the following conclusions :

1. *Diseases Involving the Tubes.* Salpingotomy and tubal resection is a most undesirable operation. Pyosalpinx always demands excision, and any tube materially damaged by any disease should be removed in its entirety.

2. *Ovarian Diseases.* All diseases of the ovaries adjudged to be non-malignant can be cured, and should be treated by resection of the diseased portions only. Recent ovarian abscesses can be cured more certainly, more quickly, and with less danger to the patient by vaginal incision, when this is practical. When the abscess is of long standing the sac should be removed, but even then some healthy ovarian tissue can almost invariably be preserved.

3. *Chronic Composite Diseases.* In most diseases of a composite nature in young women, when the tubes and ovaries are materially and equally involved, salpingectomy with ovarian resection is the most satisfactory operation, the uterus being retained.

¹ Read before the meeting of the American Gynecological Society, Chicago, May 30, and June 1, 1901; *American Medicine*, September 7, 1901.

He then goes on to state at some length that a woman is not unsexed as when both ovaries are removed, but that she is fully capable of filling all the marital relations, with the exception of bearing children.

He has performed 250 operations which he says might be classed as salpingotomies, salpingectomies, and ovarian resections. Of these he says that 40 per cent. may be termed delayed and partial cures or failures. Of this 40 per cent., by far the heaviest proportion, comes from patients on whom he has performed salpingotomy or tubal resection. The next most complaining class are those patients in whom the ovaries alone were resected, and the least suffering and who enjoy the best health are those in whom the tubes, when affected, were entirely resected and a whole or a portion of the ovary or ovaries was removed.

From this paper, he evidently tries to steer a middle course between being extremely radical and extremely conservative, but in reality rather favors the former.

A. Goldspohn¹ has performed these conservative measures in 104 cases which he has been able to follow after operation for a length of time averaging nearly twenty months. Of these cases 9 were vaginal coeliotomies, 36 were by a median abdominal incision, and 59 were performed through dilated internal inguinal rings in conjunction with the Alexander operation.

The number of the vaginal coeliotomies is too small for comparison, but in 87 per cent. of the other cases the result was uniformly good. About 3.5 per cent. only were positive failures. These operations were for the relief of adherent adnexæ, chronic inflammatory disease of the tubes and ovaries, cystic conditions of the ovary, some of the cases being associated with retroversion of the uterus. He concludes :

1. In younger women, in the absence of tuberculous or afflicted with malignant growths, one ovary or a part of both may often be preserved with or without the retention of the corresponding tube in the following conditions :

a. Follicular cystic degenerations or partially cirrhotic ovaries, due to circulatory disorders or inflammatory processes.

b. In the extirpation of parovarian cysts and dermoids and fibroid tumors of the uterus.

c. With extreme caution in glandular non-papillary cystoma of the ovary.

2. In resection of the uterine adnexa asepsis of the highest degree is essential, as is also the use of a minimum amount of fine and readily absorbable suture material judiciously placed with regard to tension.

¹ "Indications, Technique and Remote Results of Salpingostomy and Resection and Ignipuncture of Ovaries," *American Journal of Obstetrics*, November, 1901.

3. When extreme fixation of the parts abound, or when septic accumulations are not certainly absent, a median ventral incision is to be preferred. When the more extreme complications do not exist, and there is a coincident retroposition of the uterus, the operation is very successfully performed through the dilated internal inguinal rings in conjunction with a shortening of the round ligaments.

4. Vaginal cœliotomy is in general unsuitable for conservative operations on the adnexa.

HYSTEROMYOMECTOMY.

A Modified Technique from a Conservative Stand-point. Two or three years ago Abel, of Leipzig, suggested that as much as possible of the cervix and its mucosa, along with the ovaries, should be retained in hysteromyomectomy in order to conserve ovulation and menstruation.

Beyea¹ agrees with Abel and believes that there exists a class of cases of uterine myomata where the destruction of tissue is too great to permit of the actively conservative operation of myomectomy, and yet in these same cases the radical operation of hysteromyomectomy removes unnecessarily functioning uterine tissue and normal tubes and ovaries.

He refers to those myomata which destroy the upper three-fourths or less of the uterine body in which the tubes and ovaries are clinically normal.

Beyea's idea was to amputate the uterus at the highest possible point, so that a certain amount of corporeal endometrium would be left in the stump. He also leaves the ovaries.

The object of his operation is to conserve clinically normal ovaries and a portion of uterine mucosa, so that the physiological relation between these tissues would be maintained and the functions of menstruation and ovulation continued, thus preventing an artificial menopause and its sequelæ.

Beyea carried out his operation in a patient thirty-four years of age, and for more than a year afterward, up to the time of his paper, she menstruated every twenty-eight days without having any painful or unpleasant sensations.

G. Abel has reported three cases of menstruation following hysteromyomectomy with the conservation of one or both ovaries. In each of them it is to be presumed that a portion of corporeal endometrium was

¹ "The Conservation or Preservation of the Ovaries and Functionating Uterine Tissue in the Operation of Hysteromyomectomy," *American Journal of Obstetrics*, September, 1901.

left behind, although these may have been instances of cervical menstruation like those reported by Ashton and Kelly.

In justifying such a conservative operation several points are to be considered.

1. *Of What Value Are Ovulation and Menstruation to a Woman When She Is no Longer Able to Conceive?* The functions of ovulation and menstruation, if not painful, are essential elements in the happiness and health of a younger woman. As Kelly has said the pelvic organs are "indelibly associated in a woman's mind with the fundamental differences between the sexes which impress upon the female organism all that is distinctive and peculiar in her attitude toward the world at large; and with the healthy performances of her functions in the recurring monthly fluxes and ovulations, even if to only the extent here preserved, lie, though the woman be unconscious of it, some of the deepest well-springs of her happiness."

2. *How Frequently Do Pathological Changes Occur in Ovaries Left Behind?* Bulius, Papow, and von Meerderoort affirm that the ovaries in every case of myoma of the uterus, regardless of the woman's age, show macroscopically and microscopically more or less pathological changes—*i. e.*, the ovaries are enlarged partly from increase in number and size of the follicles, and partly through an increase in the interstitial tissue. It seems most likely that these changes are due to a congestion of the vessels of the ovary which develops synchronously with the growth of the tumor.

Clinical observations seem to prove that ovaries left behind that are macroscopically healthy do not undergo subsequent pathological changes. Glaneke, Brenneke, and Abel, in a considerable number of cases of hysteromyomectomy with conservation of the ovaries, have made examinations at intervals of one to four years after operation, and in no instance did the ovaries become diseased. Beyea could find but two cases in the literature of such an occurrence. Ovaries thus left behind do undergo atrophy.

3. *Will Secondary Atrophic Changes Take Place in Ovaries Conserved in Hysteromyomectomy When a Functionating Portion of the Mucosa Is Left Behind?* From the investigations of Glaneke, Brenneke, Abel, Leopold, Fritsch, Howitz, Thornton, Hamilton, and Gramatikati, it may be said that the ovaries after conservative hysteromyomectomy are enlarged for a few months. Then follows a regular diminution in size, and the atrophy is complete within three years, and in all cases within four years. The artificial menopause and atrophic changes in the external genitalia appear later and slower, and the subjective symptoms are milder than after oöphorectomy.

In the four cases reported by Abel in which a portion of the uterine

mucosa seems to have been left behind where menstruation continued after hysteromyomectomy, careful examinations were made at various periods after the operation. In these cases observed for one, two and a quarter, three and a half, and five years, no distinct atrophy of the ovaries had taken place. In all of them also there had been no atrophy of the external genitalia, and there were no symptoms of the menopause. It thus seems that the preservation of a portion of the uterine mucosa is sufficient to continue the functions of ovulation and menstruation for five years at least, and most probably up to the natural time for the menopause.

4. *Will Ovaries Left Behind Produce Painful Molimina Menstrualia and Dysmenorrhœa?* This has not been definitely worked out, but the observations of Glancke, Brennecke, and Abel have not discovered any such tendency, and there seems no reason why ovarian dysmenorrhœa should occur here any oftener than in a woman with her uterus and ovaries intact.

5. *Is There any Technical Reason Why This Operation Should not Be Performed, and Does It Increase the Danger of Hysteromyomectomy?* The blood supply to the stump is all that could be desired if the uterine artery is caught at a higher point than usual. The bacteriology of the cervical and corporeal canals has demonstrated that the endometrium is practically sterile in cases such as we are considering.

Cervical pregnancy will not occur if the precaution is taken to close the uterine canal by both muscular and peritoneal stitches.

The operation, perhaps, requires a few minutes longer than the ordinary hysteromyomectomy, but not enough to endanger life.

CHRONIC CYSTITIS.

Establishment of Artificial Vesicovaginal Fistula. Howard A. Kelly¹ says the first step in the treatment of advanced cystitis, where nearly the entire bladder is involved and there are areas of ulceration, is to drain the bladder for some weeks, and each day to place the patient for several hours in a tub of warm water at a temperature of about 38° to 39° C. He considers the usual operative method of making a vesicovaginal fistula—viz., by dissecting through the anterior vaginal wall, after the posterior wall is retracted and the cervix fixed—to be awkward and often slow or difficult. Again, the operator is prone under such conditions to make his incision larger upon the vaginal than upon the bladder surface. Again, he is often embarrassed

¹ "A New and Better Method of Opening and of Draining the Bladder in Women," *American Journal of Obstetrics*, July, 1901.

by the numerous vaginal folds in locating exactly his line of incision, and by hemorrhage which the vascularity of the parts renders constantly annoying.

Kelly obviates these difficulties by putting the patient, with bladder emptied, into the knee-chest position, and then by means of a catheter allowing the bladder to distend itself with air. The posterior wall of the vagina is now retracted, and this exposes the entire area of the vesicovaginal septum. By means of a specially made knife the operator opens the bladder by plunging the point of the instrument through the vesicovaginal septum in the median line and about $1\frac{1}{2}$ cm. in front of the cervix. The incision is easily made the required length by drawing the blade of the knife toward the interior urethral orifice, which may be readily located by digital palpation through the incision. On account of the posture there is very little bleeding in this operation. It may be performed without anæsthesia, or, if desired, after injecting a weak solution of cocaine along the projecting line of incision. Kelly says his method is of great advantage in securing drainage for operations about the urethra, and that it is the best procedure for opening the bladder for vesical calculus.

Treatment of Chronic Cystitis and Irritable Bladder. Of all functional disturbances of women none is more persistent and more resistant to treatment than irritable bladder.

Before the Nitze and Kelly cystoscopes came into popular use by specialists all cases of dysuria were classed as general cystitis. The local inspection of the bladder, however, has changed our ideas of these cases, for it is seldom indeed that a general chronic cystitis is present, and even a localized cystitis is a rare complaint. More often there is an excessive irritability of the bladder, with increased reddening of the trigonum, without marked change in the urine such as is seen in a true cystitis. For lack of a better term this disability is classed as irritable bladder.

Irrigations in such cases do little or no good; local applications are often worse than useless, and these cases often drift from bad to worse, at last becoming chronic invalids, always complaining of vesical distress, and never able to retain the urine more than an hour or two at the longest.

Internal remedies, if they do not relieve within a short time, would better be discontinued, for they may upset the digestion and exert no healing effect on the bladder. Overdistention is the best remedy so far advised, and acts most beautifully in many cases.

Hugh Young, of Baltimore, has strongly advocated hydraulic distention. Valentine's apparatus, consisting of a sliding reservoir which may be elevated some feet, serves a good purpose in these cases.

In 1895 I devised a distention apparatus consisting of a rubber balloon which could be closely rolled and inserted through a speculum, and then distended in the bladder. Very good results followed the use of the vesical balloon. This apparatus has apparently been improved upon by Dr. George H. Noble,¹ of Atlanta. He believes that much of the suffering in cystitis and vesical irritation is due to the contraction of the muscles at the apex of the trigonum and at the internal urinary meatus. He draws an analogy between these muscles and the sphincter ani, and believes that the temporary paralysis of the former by overstretching will inhibit their spasm just as surely as it does in the latter. The objection to dilatation has been based upon the fact that an instrument sufficiently large to produce the requisite distention of the vesical neck was too large to pass the external meatus without more or less traumatism.

In the hands of the inventor this instrument has been very serviceable, especially in old cases of bladder irritation about the neck or trigonum. In tubercular cystitis it has also given good results. In acute suppurative cystitis the treatment is contraindicated if the secretion of pus is copious. Thorough drainage is better.

In using the instrument one must take care that the greater half of the balloon lies in the urethra, otherwise the instrument slips into the bladder and fails to stretch the sphincter muscle. Much more power, Noble says, may be obtained by injecting the dilator with warm sterile glycerin.

To prevent overdistention he has devised a double rubber bag made with a silk mesh between the layers. To perform dilatation in this way, general anæsthesia is necessary. Nitrous oxide answers every purpose.

While I do not use the vesical balloon so frequently as formerly, because I find the hydraulic distention works very satisfactorily in many cases; nevertheless, in chronic cases the mechanical stretching with an inflatable balloon is of greater value than the simple hydraulic method.

Noble's instrument appears to be most ingeniously constructed, and should be tried in such cases as he has indicated.

THE DANGERS OF FIBROID TUMORS OF THE UTERUS.

A recent paper by Noble, of Philadelphia, is of the greatest value to the general practitioner as well as to the specialist, for he has pointed out quite clearly, from a careful statistical study of his cases,

¹ "A Device for the Relief of Bladder Spasm in the Treatment of Cystitis and Bladder Irritation," *American Journal of Obstetrics*, February, 1901.

the dangers of a tentative policy in the treatment of fibroid or myomatous tumors.

Only through such carefully reviewed statistics are medical fallacies cleared up. So, here, the old saying, "Wait until the change of life, and your tumor will cease to bother you and will disappear." The man who now makes such a statement will not be able to sustain his traditional speech, for, as Noble shows, in the first place, the menopause is greatly delayed, and, secondly, many coincident complications, either of a fatal or a very threatening kind, may arise at any time before or after the menopause. This article, therefore, should be read, and before the physician gives his traditional advice he should think of this warning, and be more conservative in his optimism as to the harmlessness of myofibromata of the uterus.

Noble¹ questions the following statements: (*a*) Fibroid tumors only exceptionally cause grave symptoms. (*b*) Fibroid tumors after the menopause undergo spontaneous cure. (*c*) Fibroid tumors only rarely cause death.

He reports, as a contribution to the study of fibroid tumors, 218 cases of his own, with especial reference to the associated diseased conditions of the uterine appendages. As complications that might have caused death were found: Ovarian cysts, 26; ectopic pregnancies, 3; pyosalpinx, 8; degeneration of the fibroid, 18; malignant disease of the ovary, 1; and malignant disease of the uterus, 15—72 in all. Of these 32 are associated pathological conditions of the uterus itself, and 39 are of the appendages.

Under complications threatening life he mentions: Appendicitis, 4; bilateral hydrosalpinx, 8; unilateral hydrosalpinx, 5; hæmatosalpinx, 1; parovarian cyst, 2; myomatous degeneration of the fibroid, 5—in all, 25 cases.

Under conditions leading to more or less permanent invalidism he noted: Calcareous infiltration, 5; cystic degeneration of ovary, 2; intraligamentous development of fibroid, 10; retroversion of uterus, 3; procidentia of uterus, 3; and salpingitis, 7—altogether, 30 cases. He says that by a moderate estimate 78 of the above patients would have died had they not been subjected to operation.

It is difficult to say how many of the patients would have died from the fibroid tumor *per se*. Among the immediate causes of death from fibroids are: (1) Hemorrhage. (2) Chronic anemia leading to cardiac and renal degeneration. (3) Pressure of tumor upon ureter or bowel. (4) Malnutrition induced by hemorrhage and by the increase in intra-abdominal pressure which interferes with the functions of the alimen-

¹ "The Complications and Degenerations of Fibroid Tumors of the Uterus as Bearing upon the Treatment of these Growths," American Journal of Obstetrics, September, 1901.

tary canal. (5) Lowered vitality of patients, and the resulting increased susceptibility to contract intercurrent illness. (6) Septicæmia from necrosis of tumor. (7) Thrombosis and embolism from an associated phlebitis. (8) Risks of pregnancy and parturition when complicated by fibroid tumors.

From the above causes Noble thinks it would not be immoderate to say that 15 of the cases might have died, independent of the deaths previously reckoned. This makes a total of 93 deaths in the 218 cases, a mortality of 42 per cent.

The author finds little in his experience to sustain the theory that fibroids tend to disappear after the menopause and after labor. In direct relation to this stands the fact that 12 per cent. of Noble's patients were over fifty years of age when their symptoms caused them to seek relief in operation ; or, in other words, at a period in life when, according to the classical history of these growths, the tumors would be undergoing atrophy. The oldest patient was sixty-seven ; the youngest was seventeen.

That the menopause is delayed from one to three years in cases of fibromata is evident from Noble's statistics. A large percentage of his cases menstruated until past the age of fifty, and one case as late as her fifty-fifth year. The relation to sterility is shown by the fact that only 99 per cent. of the 218 cases had ever been pregnant.

Among complications not mentioned are adhesions—vesical, intestinal, and appendicular. They are often the cause of pain, constipation, and disordered digestion. Extensive adhesions add definitely to the risks of operation by increasing the mechanical difficulties of their removal. Noble says that phlebitis follows operations for fibroid tumor of the uterus quite commonly. Its exact pathology is imperfectly understood, but in many cases of phlebitis following hysterectomy and myomectomy the rôle of infection is difficult to prove and to believe.

The most prominent characteristic of a series of post-operative phlebitis cases is that the patients, almost without exception, are anæmic and prostrated. Anæmia is the symptom most common to patients with fibromyomata of the uterus.

Noble had one case, which was curetted under ether, with her hæmoglobin down to 10 per cent. Recovery followed, but in other cases of grave anæmia the result was not so fortunate. The risk of shock, of œdema of the lungs, and of septic infection are all increased in anæmic patients. Those advocating a conservative attitude toward fibroids—*i. e.*, deferring any operation until the patient is becoming profoundly anæmic—would, according to Noble, act more logically if they operated early, and thus prevent the development of a profound degree of anæmia, save the patient months or years of invalidism, lessen the

immediate risk of the operation itself, and very greatly shorten the period of convalescence.

A certain number of deaths in cases of fibroid tumors also result from thrombi formed in the vessels of the tumor, which, becoming detached, produce emboli and infections of the lungs and other viscera.

Besides these alterations in the blood degenerative changes, such as fatty metamorphosis, brown atrophy, hyaline degeneration, and atheroma, have been found in the walls of the heart and of the bloodvessels in numerous instances.

Summarizing his cases, Noble believes that in one-third of them death would have resulted without an operation. In more than a fourth there would have been chronic invalidism. Of the remainder but few have not been incommoded to a considerable extent. He contrasts the results secured through the resources of modern gynecology with those which follow an expectant plan of treatment. From various statistics Noble estimates the mortality of hysterectomy and myomectomy at from 2 to 10 per cent., depending upon the case, the operator and the patient's environments.

Contrast this with the mortality estimated in his list of cases, 33½ per cent. and upward, and the inevitable conclusion is that the proper treatment of a fibroid is its early removal. The most favorable subjects for expectancy are women about the age of forty, having multinodular subperitoneal fibroids.

Conversely, submucous and intramural fibroids in younger women are the most apt to develop and to produce serious trouble.

THE ALEXANDER-ADAMS OPERATION.

The Best Method of Finding the Round Ligament. One of the difficulties encountered by the neophyte, and occasionally even by the experienced operator, is to find the round ligaments in the Alexander-Adams operation.

I was invited by an operator in Germany to witness him do a rapid operation. While he had claimed that it never required more than five minutes to locate these ligaments, he searched diligently on one side for over forty minutes, and almost as long upon the opposite side. Definite rules, therefore, for finding these ligaments are of value.

Le Roy Brown¹ intimates that the chief difficulties in the performance of the Alexander-Adams operation arise from an imperfect conception of the anatomical relations of the external abdominal ring.

The green operator mistakes the superficial fascia of the abdominal

¹ American Journal of Obstetrics, April, 1901.

wall for the aponeurosis of the external oblique or for the intercolumnar fascia. This superficial fascia may be dense when it resembles the aponeurosis of the external muscle, or it may be quite delicate, when it might be mistaken at the position of the external ring for the intercolumnar fascia. In either case the operator after incising it gropes about in the tissues directly beneath for the round ligament, when he really has not yet reached the objective plane of his operation.

Another difficulty is to bring the incision directly over the external abdominal ring. To do this there must be extreme care exercised in retraction of the incision. In fact, this is so important that Brown advocates making the incision very much as the celiotomy incision is made, viz.: by picking up the tissues in the depth of the wound and dividing them between two pair of forceps. In this way no deflection from the line of incision is possible. Bleeding-points should be controlled by pressure or by torsion, because staining of the tissues with blood renders the recognition of anatomical planes more difficult.

The incision is begun one-quarter inch below the pubic spine and continued upward parallel with Poupart's ligament. As soon as the external ring is reached the intercolumnar fibres are divided and the projecting mass of connective tissue, round ligament, genital branch of the genito-crural nerve, etc., is seized with blunt-toothed forceps (sharp-toothed forceps should never be used, as they may cut the ligament).

The genital nerve is usually accompanied by its vein and lies below and to the outer side of the round ligament. It should be held to one side as the ligament is drawn out and secured.

Brown says that by bearing these points in mind Alexander's operation is made comparatively easy.

CANCER OF THE RECTUM IN WOMEN.

A New Operation. George M. Edebohl¹ says that the gynecological surgeon rebels at the idea of approaching carcinoma through the sacrum.

The incision in a Kraske operation is complicated, and the operative area is difficult to keep clean under almost any condition. The patient finds decubitus in the lateral position, which is required after this operation, very irksome.

If the Kraske operation accomplished that which is attainable in no other way, then it might be justified. But it is obvious that carcinoma of the lower rectum—*i. e.*, the lower 7 to 8 cm.—can be approached very readily either through the perineum or through the vagina.

¹ "Is the Kraske Operation Justifiable in Women?" *American Journal of Obstetrics*, August, 1901.

In carcinoma of the upper rectum the vaginal route would be applicable were it not for the fact that in such a case it is necessary to remove postrectal diseased structures and the sacral glands. To do this well the vaginal incision is inadequate. But the Kraske is no better, for the sacral glands lie above the level of the third sacral vertebrae, and this joint is the limit to which the sacrum may be removed with safety.

For attacking carcinoma of the upper rectum, Edebohls devised and carried out very successfully in one case a new plan of procedure. The patient was four months pregnant, and had for that length of time exhibited symptoms of carcinoma of the rectum. Examination showed a tumor mass occupying the upper part of the rectum and the lower end of the sigmoid flexure. The carcinoma extended to within 12 cm. of the anus. The tumor and bowel were fairly movable on the surrounding parts. There was, however, almost complete obstruction, with distention of the bowel above with fecal matter.

His operation consists of a resection of the upper rectum by means of an incision carried through the left rectus muscle. The uterus is sacrificed, if necessary, to gain free access to the affected bowel and the tissues and glands posterior. The method does not exclude any aid that may be obtained by performing some of the manipulations through the vagina.

After resecting 18 cm. of the bowel in his case, consisting of 7 cm. of gut above and 3 cm. below the 8 cm. of carcinoma, Edebohls removed the sacral glands and all fatty and connective tissue clear down to the sacral periosteum. The lower cut end of the sigmoid flexure was now invaginated with the upper cut end of the rectum, and the invagination was maintained by two rows of interrupted ten-day catgut, twenty sutures to a row. These sutures embraced the outer coats of the bowel only, and did not penetrate to the submucosa. The suturing was the only really difficult part of the operation. A small strip of gauze was adjusted about the bowel along the line of suture and led into the upper open end of the vagina.

The abdominal incision was closed without drainage, and convalescence was uneventful.

Edebohls defends hysterectomy as a preliminary to this operation when it is required to secure good exposure of the bowel, by saying that carcinoma of the rectum is in itself so grave a condition that all the vital forces of the individual are needed, and that a woman in such a condition should be considered exempt from the drain of further child-bearing.

Its advantages over the Kraske operation are as follows: Greater thoroughness in the removal of diseased parts, and possibility of deter-

mining by the abdominal incision whether there are secondary metastases to the liver. This is important, for if metastases are found, operation should be at once abandoned.

With the operation a preliminary colotomy, and in favorable cases a secondary operation for closure of the artificial anus, becomes unnecessary.

Finally, the possibility of securing good drainage and maintaining thorough asepsis is self-evident.

ORIGIN OF DERMOID CYSTS.

In the June number, 1899, of *PROGRESSIVE MEDICINE*, I very enthusiastically reviewed a splendid article by Krömer on the origin of dermoid cysts of the ovary. Briefly stated, Krömer's research went to prove Wilms' theory that ovarian dermoids are atypical growths of an unfertilized ovum within the ovary, a kind of pathogenesis. For this reason, instead of using the term dermoid cysts, Wilms has suggested that they be called ovarian embryos. This theory, as elaborated by Krömer and others, is a most plausible one, and, while Bandler gives it some hard raps in the following article, I nevertheless feel inclined to hold tentatively to it until it is more definitely disproved. The following article takes for its text the old inclusion theory, which has been quite general for the last decade or more. The paper is a good one, and should be read carefully. To gain the fullest grasp of this subject the reader is referred to the review of Krömer's paper referred to above.

Bandler believes that dermoid cysts of the ovary are to be explained upon the theory of Cohnheim, which accounts for the origin of tumors from a misplacement of cells in the early embryo and the subsequent development of these misplaced cells, called "embryonal rests," in an abnormal situation. Most tumors are either of the connective tissue or of the epithelial type, but some of them contain both connective tissue and epithelial elements, and the latter are called teratoid tumors, of which the dermoid cyst is the most frequent variety.

These teratoid growths are of a peculiar mixed character containing different elements of complex tissues or structures in a place where these do not normally occur. Thus, cysts or solid growths of the ovary which contain skin, glands, neuroglia, etc., or growths of the kidney, composed of glandular structures, smooth and striated muscle, cartilage, fat, elastic fibres, etc.—both are varieties of mixed tumors or teratomata.

These mixed tumors may occur in the orbit, neck, mediastinum, sacral region, retroperitoneal connective tissue, kidney, cellular tissue of pelvis, ovary, vagina, cervix, and bladder.

Teratoid tumors may be of varying complexity; that is, they may contain but skin and connective tissue, or they may be very complex, containing teeth, bone, hair, skin, fat, cartilage, glands, and neuroglia. The more complex ones are those occurring in the orbit, the neck, the sacral region, the retroperitoneal connective tissue, and the ovary. All of these tumors, whatever their complexity or situation, Bandler believes may be accounted for in the same way, viz.: by a misplacement of embryonal cells and their subsequent development. Other authors, notably Wilms, advances theories for these mixed tumors, which differ according to the complexity of structure of the growth and according to its situation. For example, the simpler mixed tumors, as those of the kidney, they say, are to be explained by the theory of Cohnheim, *i. e.*, are inclusion forms; but the more complex tumors, as those of the orbit, ovary, etc., in which they claim to find cells from each of the early layers of the embryo, they do not ascribe to this cause. Furthermore, they give a different theory in regard to the complex mixed tumors of the ovary and those occurring elsewhere. The first part of the question hinges upon the cell formation of the early embryo, and we may briefly refer to that. The fecundated ovum, a single cell, divides and subdivides until three layers of cells are formed lying parallel to one another. These three layers comprise the outer or ectodermal cells, from which develop the middle or mesodermal cells, and from this finally springs the inner or entodermal cells. Complex mixed tumors in which are found skin, bone, and glands resembling intestinal glands, Wilms says are not mere displacements of cells, but are an atypical growth of the entire three layers of cells of the early embryo, and he considers them to be true parasitic formations when found in the orbit, neck, retroperitoneal, connective tissue, and sacrum. Such cases have been reported by Weigert, Breslau, Rindfleisch, Marchand, and Sloman, and Wilms considers them as true double formations—that is, atypical fetuses developing parasitically upon or within another foetus (fetus in fetu). This assumption is based upon the supposition that in these tumors are found ectodermal, mesodermal, and entodermal elements; for otherwise, fetus in fetu could not be considered.

When they (Wilms and others) come to the question of the complicated tumors of the ovary they ascribe these mixed tumors (as dermoid cysts) to an entirely different source, viz., to the atypical growth of an unfertilized ovum (parthenogenesis).

In all of these complex tumors which are considered examples either of fetus in fetu or of parthenogenesis, all sorts of organs are said to have been found, viz., trachea (Baumgarten), nose (Bottlein), intestine (Perls, Neuman, Baumgarten), eye (Baumgarten), mamma (Velits), extremities (Klausner), central nervous system (Friedrich), ribs and

pelvic bones (Kustner), and bladder, besides the usual teeth, cartilage, epidermis, hair, etc. They have never observed liver or kidney structures in a supposed example of fetus in fetu or parthenogenesis, and this they explain by saying, "Since not alone the circulation, but also the nutrition and excretion of used-up products, is regulated by the mother, this explains the constant absence of certain organs, such as liver and kidney."

Bandler states that in these complex tumors cells from each of the three layers of the embryo are never found. Skin from the ectodermal and bone and cartilage from the mesodermal layers are undoubtedly present, but the glandular structures and high columnar epithelium which Wilms considers entodermal have been shown by Bandler to be nothing more than modified ectoderm or embryonal mesodermal cells. Bandler has often found in his dermoids squamous epithelium directly continuous and merging with columnar and goblet cells like those of the intestine.¹

He compares the glandular structures of these tumors to and believes them analogous with the salivary glands which are derived from the ectoderm. The columnar epithelium is analogous to that of the nasal cavities, and also a derivative of the ectoderm. The various organs alleged to have been found, as trachea, eye, extremities, intestine, etc., are the products of a disordered imagination which has, for instance, called a glandular space surrounded by a few muscle fibres intestine, and a space lined by columnar epithelium in proximity to cartilage trachea. The very fact that in these supposed types of fetus in fetu or parthenogenesis the kidney, liver, and pancreas have never even been supposed to exist, Bandler thinks is significant, and repeatedly affirms that entodermal products in these growths have never been proved.

Confining his remarks to Wilms' theory of parthenogenesis for ovarian dermoids, which are but a variety of the mixed tumors, or teratomata, Bandler advances the following arguments against such a theory :

1. Dermoids of the ovary rarely contain voluntary muscle fibres. Why should such muscular tissue not be found if these tumors are examples of parthenogenesis ? Bandler then calls attention to the fallacy of Wilms in explaining this point. "It is only a pure hypothesis on my part (Wilms) when I say that perhaps the inability to exercise movement may cause this poor development of striations (voluntary muscle fibres) in the malformation."

2. Ovarian dermoids never contain entodermal elements, and therefore they cannot be considered to be made up of derivatives from all the embryonal layers, *i. e.*, they are not malformations.

¹ Wilms himself ascribes the glandular structures found in mixed tumors of the kidney to embryonal mesodermal cells, which may differentiate into epithelium, glands, etc.

3. The teeth found in ovarian dermoids, as a rule, correspond¹ to the side of the body from which the cyst originates. That is to say, in a dermoid cyst of the left ovary the teeth, in their conformation, are like those found on the left side of the jaws. If these cysts were malformations this would hardly be true, but in a tumor caused by embryonal inclusion it is just what one would expect.

4. Dermoid cysts may grow from the broad ligament near the ovary and yet have no connection with the ovary, although the latter shows, as a rule, various changes. To explain such tumors on parthenogenetic grounds, Wilms has ascribed them to the presence of a third ovary—a very rare and even problematical occurrence.

5. The number of dermoids (five) that have been found in a single ovary speak for congenital factors in their production and against the theory of parthenogenesis.

6. The occurrence of dermoids in both ovaries (bilateral in 20 per cent. of cases) also is against Wilms' theory, and speaks for some disturbance in the developmental stage of the ovary.

7. That from an ovum a growth in the sense of a tumor should be formed which not alone contains the product of all three germinal layers, but also these products in a grouping which fully resembles that of a foetus, Bandler says, is a view which goes far beyond the limits of pathology. That these products should also grow to the same degree as the cells and tissues of the patient, and should form long hairs, second teeth, etc., is a view which gives to a non-fecundated ovum a power which as yet has not been observed in a fecundated ovum situated in an ovary or in the tube.

8. If these tumors are examples of parthenogenesis, why are never placenta or membranes formed, which also originate from the germinal layers of the ovum?

9. Wilms, believing in parthenogenesis, naturally does not consider all dermoids to be congenital, and therefore he sometimes finds it difficult to explain the forms of teeth found, and he accepts for this the following hypothesis: "If the dermoids are considered as rudimentary embryos we should expect in them milk-teeth corresponding to the normal. Since, however, the statements concerning milk-teeth in dermoid cysts are very rare and uncertain, we are forced to adopt the theory of a certain dependence as regards development of organs within the dermoid cyst upon the age of the mother. We must believe that, under the influence of a common circulation of the maternal and fetal organisms, tissues like the teeth follow in their development the form

¹ Bandler has actually proven this in nine out of eleven cases, and in the two doubtful ones there is some question as to the correct location of the growth.

and structure of those of the mother." Bandler says : " We are therefore, according to Wilms, compelled to believe that an ovum develops without fecundation, but is so influenced by the maternal organism during its development that in a tumor which, according to Wilms, may be only one or two years old, second teeth are formed because the mother has second teeth."

10. Concerning the opinions as to the possibility of parthenogenesis, Bandler says that Wendeler and others attempt to support Wilms by the quoted statement that the division of non-fecundated ova has been observed in rabbits, etc. The authors whom Wendeler quotes, and who have observed this cell division, state positively that such ova always degenerate.

Hensen, Nagel, Spee, and Waldeyer do not believe in parthenogenesis. What was once considered the parthenogenetic segmentation of the hen's egg is now referred to a fecundation with dying spermatozoa, and this same occurrence in the bird's eggs has been shown by Barfurth and Lau to be but an irregular process of segmentation. Sobotta asks whether, since proof that parthenogenetic segmentation of the hen's egg does not occur, the egg of mammals is ever subject to such a process. Olshausen says that any other explanation for the dermoids of the ovary than is given for dermoids of other parts of the body " makes it necessary to adopt two entirely different theories for seemingly like formations."

Bandler, as we have said before, gives the same explanation for tumors in the following regions : Mixed tumors of the head, neck, and mediastinum, of the sacral region, of the pelvic connective tissue, of the kidney, of the retroperitoneal connective tissue, of the ovary, of the cervix, vagina, and bladder.

Let us see how he accounts for them in each situation. It is easy to see that at the various points of union in the development of the head, face, neck, and mediastinum, spine, spinal cord, etc., as well as at all the other foetal furrows, clefts and points of union where, through disturbances of normal development, congenital malformations, fistulae and deformities may occur ; also mixed tumors or dermoid cysts may be found.

This formation results from an unfolding or a displacement of cells, either ectodermal or mesodermal, but usually both. These cells subsequently develop and form the same tissues which they would have produced had they not been detached from their normal location.

In this rational way Bandler explains all forms of mixed tumors. This simple outline of his theory suffices for tumors of the head, orbit, neck, mediastinum, sacral region, etc., as all of these are more or less superficial, and it is easy to understand their mode of development. It

is with reference especially to the retroperitoneal, the kidney, and the ovarian mixed tumors or dermoids that we must elucidate Bandler's theory.

These tumors are explained, not as inclusions from the surface ectoderm and the mesoderm of the embryo, but from derivatives of the ectoderm which have a mesodermal stroma, viz., the Wolffian bodies and ducts. The earliest embryonal part of the generative organs is the Wolffian body, which consists of a series of tubules lined by epithelium. This Wolffian body at first serves as an excretory organ for the embryo and has a duct, the Wolffian duct, the histological structure of which is the same. (Spee has proved that both the Wolffian body and the Wolffian duct epithelium come from the ectoderm.)

The sexual gland (ovary) is formed on the outer side of the Wolffian tubules from ectodermal cells carried there by the Wolffian tubules. To the outer side of the Wolffian duct another tube develops from the ectoderm, the duct of Müller, which ultimately forms the Fallopian tube. It will be understood that all of these structures have a connective tissue or mesodermal stroma, and that in speaking of their ectodermal origin we refer to their epithelial elements.

In the mature female fetus the sexual gland becomes the ovary, the Müllerian ducts above represent the Fallopian tubes, while below they fuse to form the uterus and vagina. The Wolffian body remains as a useless atrophic structure, its tubules lying within the folds of the broad ligament, extending into the hilus of the ovary, and through the ovary, and perhaps even up to its surface, forming the paroöphoron and the transverse tubules of the parovarium. The atrophied Wolffian duct remains as the longitudinal tubule of the parovarium, and it may be traced down along the sides of the uterus to the vaginal walls. Upon the Wolffian body and duct which develop from the ectoderm depend the dermoids of the ovary, retroperitoneal connective tissue, cellular tissue of pelvis, and those of the cervix, vagina, and uterus.

Regarding directly the origin, first, of the mixed tumors of the kidney: The Wolffian body develops high up in the abdominal cavity, close to where the real kidney subsequently appears, and Wilms himself, Birch-Hirschfeld, and others believe that the mixed tumors of this organ originate from mesodermal cells displaced into its neighborhood by the Wolffian body.

In a consideration of the dermoid tumors of the ovary, which are usually cystic, it is well also to look into the origin of the glandular varieties of ovarian cysts, for Bandler believes that as to their etiology they have much in common.

Cystadenomata (multilocular ovarian cysts) are frequently combined with dermoids, and, indeed, they may be found side by side in the same

ovary, and may form a double tumor, or may be united by adhesions and perforation of their walls into one tumor. In the dermoid prominence (the area of the cyst wall where it is the thickest) of almost every dermoid cyst, whether a cyst adenoma is present or not, we always find those smaller or larger glands or cysts which in every way have absolutely the same structure, cell for cell, as is found in cyst adenomata of the ovary.

Authors are at variance as to the origin of the glandular cystomata of the ovary. Pfannenstiël attributes these tumors to the follicle epithelium and the germinal epithelium of the ovary, but he says with regard to the possibility of their originating from the parovarium (Wolffian body and duct) that such a view, from a theoretical standpoint does not seem impossible, but it is improbable, because parovarian tubules do not extend into the ovarian tissue. But in this he is in error, for the presence of these tubules in the ovary itself has been demonstrated in many cases. If we compare the various forms of the cystadenomata of the testicle with those of the ovary we find them histologically nearly identical, and since these cysts in the testicle have only one source of origin, viz., Wolffian tubule derivatives, whether the latter happen to be the tubuli recti, the *rête testis*, the organs of Giraldes, or Wolffian remnants, we may justifiably infer the same source of origin for cystadenomata of the ovary.

As to the origin, then, of the ovarian dermoid, the Wolffian body and duct, through their position in the mesoderm; their connection to the ectoderm; their relation to the normal development of the ovary; their subsequent position at the hilus of the ovary, and the extension of their tubules into the vascular layer, and the growth of these through the ovary even up to its surface; and from the fact that their remnants furnish the ciliated growths of the broad ligament and form the cystadenomata of the ovary—for all these reasons we may say that they are capable of carrying with them mesodermal and ectodermal cells up to or into the ovary, which subsequently develop there and give rise to dermoid tumors, either solid or, as is more usual, cystic ones.

THE SURGICAL TREATMENT OF DYSMENORRHOEA.

Henry D. Fry¹ says that the menstrual period in a healthy woman with normal pelvic organs should never be painful. He urges that the relationship between the general health and the functional activity of the generative organs in woman should be constantly kept in mind, and divides cases of dysmenorrhœa into three classes:

¹ "The Surgical Treatment of Painful Menstruation," *American Gynecological and Obstetrical Journal*, December, 1901.

1. Those in whom the want of fresh air and exercise, mental and physical overwork, and poor food bring about impoverishment of the blood, neuralgic affections, and dysmenorrhœa in a woman having healthy pelvic organs.

2. Those in whom stenosis of the cervical canal, endometritis, displacements of the uterus, and diseases of the appendages produce the same results in a woman with excellent general health.

3. Those in whom the general and local causes are combined.

The treatment of the first class is usually non-surgical, the disability often occurring in school-girls or in single women who neglect the rules of hygiene in their daily life. In such cases before submitting them to the ordeal of a gynecological examination it is well to try general treatment.

The surgical treatment of the condition in question is rather disappointing if one judges by the pessimistic statements of some men of large experience.

Fry believes that this result is due, in uncomplicated cases of pathological ante flexion, to the transitory effect of dilatation and curettage as ordinarily performed. He follows the line of treatment advocated by Wylie, viz., thorough dilatation, curettage, application of pure carbolic acid to the endometrium, followed by the introduction of a Wylie drainage-plug into the cervical canal. This is allowed to remain in position for about three to six weeks. The patient goes to bed for about two or three weeks, and then she is permitted to get up and go around, wearing the plug several weeks longer. This plug, Fry believes, does much to add to the permanency of the result of the operation.

The conditions usually found in cases which are most benefited by this plan of treatment are failure of development of the external genitalia, a small vagina, cervix, and uterus, stenosis of the cervical canal from an exaggerated ante flexion, and a chronic endometritis in consequence of deficient drainage of the uterus.

The complicated cases are those associated with malposition and disease of the uterus or its adnexa. Thus, for the relief of dysmenorrhœa, in some instances, Fry has removed small fibroids from the uterus, and in others he has excised diseased tubes or ovaries.

A prolapsed ovary in one of his cases was the cause of severe dysmenorrhœa, and relief was obtained only after removal of the organ.

IMPROVED LEG-HOLDER.

Notwithstanding there are a number of very satisfactory devices for supporting the legs in the lithotomy position, a recent device of

E. Pierre Mallett¹ appears to be an ingenious one for this purpose. It consists of two stockings, made of canvas, which reach to the knees, and are made to buckle from their outer surface to a shoulder-strap.

The points of usefulness especially advanced by the author are : (1) They do not compress the popliteal space or constrict the leg, the tension being practically in the axis of the tibia, as in pulling on a pair of boots ; (2) they are easy to adjust ; (3) they keep the patient's feet warm ; (4) they can be sterilized with dressings, and serve the purpose of sheets or towels ; (5) and, finally, they are inexpensive.

LAY INSTRUCTION UPON SEXUAL DISEASES.

The limitation and prevention of the spread of gonorrhœa has been a subject which has occupied the minds of moralists, theologians, law-makers, and physicians for more than a century, and still its ravages are unabated. The following suggestion, while possibly not practical, is at least novel. Rufus B. Hall² says that it is beyond dispute that pelvic inflammation in women, with all its attendant evils, is accompanied by the greatest suffering inflicted upon womankind. This period of suffering may be prolonged over months and years, and ends finally in an operation which perhaps saves the woman's life, but leaves her permanently crippled.

Physicians know that gonorrhœa in women might be prevented if the persons most interested were possessed of the knowledge that is due them. The solution of the problem is only found in the education of the laity upon these matters. There is certainly felt a great delicacy on the part of parents to talk of these matters with their sons and daughters, and Hall believes that if during the last year in high school a text-book were employed embracing embryology, hygiene, anatomy, and physiology, including sexual physiology, much would be done to prevent the present social evil. This subject could be presented to female students by a teacher of their own sex, and the same thing is true with regard to the males, without shocking the morals of the most fastidious or susceptible individual.

It is well known to physicians that the subject of "clap" is considered a joke among many young men, and is looked upon as a disease that is readily recovered from and hurts no one. If these young men knew the seriousness of the affection—if they knew that gonorrhœa

¹ "An Efficient Aseptic and Economical Leg-holding Device," *American Gynecological and Obstetrical Journal*, October, 1901.

² "The Education of the Laity upon Sexual Matters," *American Journal of Obstetrics*, November, 1900.

was more dangerous than syphilis, and that, although apparently cured, they might years afterward infect their wives—then good would be accomplished in two ways, *e. g.*, gonorrhœa would be less frequent and young men would be better morally. Let young women be taught by instruction in the class-room and demonstration of a few lantern-slides the havoc that may be wrought in the pelvic organs by gonorrhœa, and we would have fewer women marrying men of loose habits. Let parents realize the danger of the disease in question, and they will consider more the moral cleanliness of the man she marries rather than his position or wealth. A further evil that could be corrected is that of criminal abortion in married women. Let them be taught the dangers of such a proceeding, and it would do more to prevent its occurrence than all the moral suasion in the world.

AN AID TO THE DIAGNOSIS OF RENAL CALCULUS.

Howard A. Kelly¹ believes that his own method of ascertaining the presence of a calculus in the urinary tract, by passing a wax-tipped catheter up the ureter into the kidney, to be the most direct. His technique may be summarized as follows :

Preparation of Catheter. A wax mixture is prepared from dental wax and olive oil, in the proportion of two parts of wax to one of oil ; in hot weather the amount of wax must be increased to three parts. The wax mixture is kept in a small, wide-mouthed bottle, and, when needed, the bottle is heated over an alcohol lamp so as to melt the wax ; then a renal catheter, $1\frac{3}{4}$ to 2 mm. in diameter, is dipped into the wax mixture up to its eye, which must not be occluded, and quickly withdrawn. The air quickly dries the wax, which then coats the end of the catheter with a smooth, shining surface that is not disturbed by contact with the moist, soft body tissues, but readily shows contact with any foreign body.

The catheter should not be dipped into the wax mixture more than once, or we may have surface irregularities by the formation of successive layers which might rub off ; also, care must be taken that no water runs from the eye of the instrument, mixing with the wax, for in this way little blebs and a broken surface are produced. The wax tip should be examined with a pocket lens in order to detect any marks or any peculiarities in its surface.

One of the essential points in the successful employment of the wax-tipped catheter is to introduce it into the ureteral orifice and to with-

¹ "Scratch-marks on the Wax-tipped Catheter as a Means of Determining the Presence of Stone in the Kidney and in the Ureter," *American Journal of Obstetrics*, October, 1901.

draw it without ever touching the speculum or the pubic hairs. A steady and trained hand is necessary to conduct the point of the instrument through the cylindrical speculum to the ureteral area, and a sure eye and a good aim to introduce the tip into the ureteral orifice upon the first trial. If one fails the first time, upon withdrawing the instrument for one or more successive efforts the wax is apt to catch upon the narrow rim of the speculum and be ploughed up in such a way that is likely to prove disastrously misleading when studied with a lens after the procedure is completed. If there is any doubt, therefore, as to whether the wax has collided with the speculum it is a good rule to re-examine with a fresh instrument. When pushing the instrument up the ureter into the kidney the operator must be always on the alert to detect any obstruction, for thus he is able to measure the location of a ureteral calculus. When the catheter touches the top of the pelvis of the kidney a sense of resistance is felt by the hand, and then before the stylet is withdrawn the catheter is moved up and down to the extent of 4 to 5 cm., so as to insure contact with the stone if one lies in the pelvis. A catheter striking a stone in the kidney, or more especially in the ureter, gives an impression of an obstruction to the finger as that of a rather tight stricture.

After the eye of the instrument has passed the stone, or as it enters the renal pelvis, there is an immediate discharge of urine much greater in amount than could have been secreted during the passage of the instrument; this urine differs in specific gravity from and contains much less urea than the mixed urine from the bladder or that from the opposite side. A pyonephrosis or pyoureter may be revealed by the presence of pus in the urine.

An excess of calcium and magnesium phosphates in the urine of one kidney as compared with that of the opposite side may be shown by the inspection of a weak solution of HCl (15 cm. of a 0.5 per cent. solution, withdrawn in ten minutes). A stone sometimes causes a grating feeling as the catheter is withdrawn, or there is the sensation as if the instrument were grasped in the bite of a stricture. Fragments of stone may be brought away either in the eye of the catheter or washed out by fluid injected into the kidney. Kelly reports eleven cases in which kidney or ureteral calculi, or both, were diagnosed by this method. In one of these cases, in which a stone was present in the lower portion of the ureter, the ureteral orifice was well dilated, and no further interference was adopted. Nineteen hours afterward the stone was passed. Kolischer and Caspar have both attained the same end by the injection of sterilized oil.

Although the presence of scratch-marks on the wax-tipped catheter, when the instrument has been used with care and skill, always indicates

ureteral or kidney stone, their absence does not always establish the non-existence of stone. Variations from the normal in the urinary tract may account for this fact, such as :

1. Cases of malposition of the kidney or kink of the ureter, where the catheter tip is unable to come in contact with the stone unless the difficulty can be overcome.

2. Cases in which the stone is embedded so deeply or in such a manner in the calyces of the kidney that the wax tip does not reach it.

3. Cases in which, from some anatomical peculiarity, the course taken by the catheter is misleading. Such cases are those of divided pelvis, where one division only is the continuation of the ureter, and the stone lies in the other division ; or those of double ureter, when the ureters may either unite into one, and the condition be hard to discover, or they may both penetrate the bladder, when the condition may be recognized with ease.

In conclusion, Kelly emphasizes the following points :

1. Catheterization of the ureters with a wax-tipped catheter is the most direct means of ascertaining the presence of calculus in the urinary tract.

2. The success of the method depends upon care and skill on the part of the examiner, together with attention to detail in the preparation of the instrument.

3. The presence of scratch-marks is the most important feature in diagnosis of calculus by this means, but the method affords valuable confirmatory evidence in other ways.

4. In ureteral calculus the method of dilating the ureter, and thus inducing the escape of the stone through the natural channels, may obviate the necessity for operation.

5. The presence of scratch-marks, if all precautions have been taken, is positive evidence of the existence of calculus, but the absence of scratch-marks cannot be accepted as proof that no stone exists.

6. The possible presence of a double ureter, with two openings into the bladder, should always be borne in mind.

PREVENTION OF POST-OPERATIVE ADHESIONS.

Causes of Adhesions. Each year during the last decade has seen constantly improving mortality and post-operative convalescent statistics. Peritonitis is hardly taken into account in clean peritoneal cases, stitch abscesses are quite infrequent in the hands of the best operators, and post-operative adhesions either of major or minor grade are very rare. The latter I believe to be due to the observance of general principles which are laid down in the following paper :—

George Gray Ward¹ makes the obvious statement that the prevention of post-operative adhesions is important not only from the immediate dangerous results, but also from the remote consequences.

Adhesions may form after operations of the simplest character and when there is primary union of the abdominal incision and no symptoms whatever of infection.

Rohé states that 1 to 2 per cent. of the deaths following coeliotomy are due to intestinal adhesions. Spencer Wells lost 1.1 per cent. in 1000 coeliotomies from the same cause, and Fritsch's percentage was 1.6 per cent. Vander Veer lost 3 cases in 145 coeliotomies, and Rockwell found 34 per cent. of 69 cases of intestinal obstruction due to adhesions.

Post-operative obstructions are usually due either to fixation of the intestine by adhesions to a pedicle stump or to a raw surface, or to an area denuded of peritoneum left after the breaking up of inflammatory adhesions. Sometimes the gut is compressed or fastened by inflammatory bands, which may cause obstruction immediately or years after the operation. Cases have been reported five months, four and a half years, and six years after. Should the patient escape obstruction, even though adhesions exist, she will probably suffer from pain referred to the region of the liver, the stomach, or the kidney.

It is easy to see how adhesions occur between raw or infected areas, but how they form between apparently uninjured and normal serous surfaces is a difficult problem for solution. Upon this question investigators are divided. Kelterborn believes that such adhesions are the result of bacterial infection which is very mild in degree and clinically unrecognizable. He also says that a single peritoneal surface denuded of its endothelium is sufficient to cause adhesions, for endothelium once rubbed off or destroyed is not renewed.

Coe agrees with Kelterborn. Gersung and Klotz showed that hemorrhage and organization of the blood clots may cause adhesions. Delbet, Grandmaison, and Bresset have shown that solutions of carbolic or salicylic acid and of the bichloride and biniodide of mercury are very harmful immediately to the patient, and by their irritating properties predispose to the formation of adhesions. Walthard has proved that long-continued contact with air so damages the serosa that the superficial layer of cells dies. When two such serous surfaces come in contact they either adhere, if they remain long in contact, or there may occur between them a spongy, fibrinous exudation if peristalsis is active and the areas are not constantly apposed. There are two theories to account for the action of air upon an exposed serous surface. According to the researches of Kuhne, Scholz, and Pflüger, air may act chemi-

¹ "The Prevention of Post-operative Adhesions of the Peritoneum," *American Journal of Obstetrics*, June, 1901.

ually in this way. In every operation, no matter how complete the hæmostasis, the hæmoglobin in the red blood-corpuscles of the blood circulating in the peritoneal vessels combines with the oxygen of the atmosphere, changing it into ozone and setting some oxygen free. This is in a nascent state and acts as a powerful oxidizing agent upon serous surfaces. In a physical way air may do damage to the peritoneum by its drying properties whenever its humidity does not represent its highest point of saturation.

To investigate the infectious possibilities of the atmosphere and its chemical and physical effects just noted, Walthard constructed a glass bell-jar, in the top of which was placed a thermometer to record the internal temperature. There were two inlet tubes and one exit tube connected with the jar, so that a continuous stream of air or steam or any gas could be maintained in the jar at a uniform temperature, while it enclosed the site of operation. With filtered air the post-mortem always showed adhesions, and this is in accord with observations of Thomas, who believes that adhesions may occur between two aseptic serous surfaces, even where there is no macroscopical injury to be found.

Walthard then exposed the peritoneum to steam at 38° C., and in not a single case was there any adhesion formation.

One may justifiably conclude from these investigations that the damaging influence upon the peritoneum of the atmosphere depends not only upon the infection and dust-carrying properties of the latter, but also upon the physical and chemical influences which it exerts while in a state of dryness.

Turek found that heat was a great factor in the prevention of peritonitis, and that when staphylococci are put into the peritoneal cavity, if heat of 48° to 50° C. is applied within the abdominal cavity during the time corresponding to the exposure and manipulation of the viscera the inoculation by pathogenic or non-pathogenic germs seldom results in infection and death. Ward then classifies the etiological factors in the formation of adhesions as follows :

Adhesions of peritoneum.	Sepsis.	Virulent: General peritonitis with lymph and fibrous exudate. Mild: In circumscribed areas only sufficient to produce a local inflammation, with plastic exudate.
	Trauma.	Severe: Denuded areas; adhesion formation by the natural process of repair. Mild: 1. Excessive manipulation. 2. Desiccation from dryness of air. 3. Cold. 4. Chemical irritation from antiseptic solutions. Causes: Pseudo-ileus and necrosis of endothelial cells.

We may lay down the statement, therefore, that the formation of peritoneal adhesions after operation is directly proportional to the amount of sepsis, traumatism, dry air contact, loss of heat, and raw surfaces left at the completion of an operation.

Prevention of Post-operative Adhesions. The fact that pedicle stumps and denuded surfaces were early recognized as one of the most frequent causes of intestinal obstruction from adhesions has led to many suggestions as to the prevention of the complication. A. Martin brushed over such areas with sterile olive oil. R. Stein used collodion. Morris used aristol, which he says is insoluble in serous fluid and quickly forms a protective covering with the coagulated lymph which cannot be brushed off. This is from experimental work on rabbits. Cloth of catgut, gold-beater's-skin, and prepared animal peritoneum have thus been used.

Kelly has suggested covering areas in Douglas' pouch by protecting them with the uterus turned backward and fixed by a suture in the position of retroflexion. Weith advises distending the bladder with a boric-acid solution for the first few hours after operation. Most valuable is the suggestion of Stimson—*i. e.*, individual ligation of the vessels and extraperitoneal stumps. Another method, as advocated by Senn, is to protect raw surfaces with omental grafts.

It is practically impossible to exclude all germs from a celiotomy operation; therefore, we must attribute to the resisting or bactericidal powers of the individual the recovery from the infections. The operation, in consequence, should be as short as possible. Everything that will shorten the time of exposure of the peritoneal cavity to air-contact should be employed. Technical operative skill and trained assistants are therefore very necessary. Unnecessary trauma to intestines should be guarded against by the employment of: (1) the Trendelenburg position and the prevention of distention of the bowels during the operative manoeuvres by careful evacuation of the intestinal tract before operation; (2) by the avoidance of rubbing the peritoneum with sponges and of the use of antiseptic solutions.

The drying action of the air and the loss of heat should be constantly kept in mind, and all exposed serous surfaces should be protected with gauze wet with hot saline solution. The air of the operating-room should be at its highest point of saturation. All blood clots should be removed and thorough hæmostasis secured before closing the incision.

One of the most important measures in prophylaxis is in the replacement of the intestines and the omentum in their normal relations; this cannot be better accomplished than by floating them on the surface of salt solution left in the abdominal cavity.

To further prevent adhesions by measures taken after the operation, early catharsis is supplemented by enemata or by inflation of the intestines with oxygen in the Trendelenburg posture as advised by Cleveland.

The patient should be encouraged to frequently change her position in bed during the early hours after the operation, as in this way the intestines move upon one another and assume their normal relations.

This free motion of the abdominal contents should not be hindered by a tight abdominal dressing.

While there may be some dispute as to the question of permitting the free movement in bed shortly before operation, the general principles laid down in this portion are excellent. As I have been such a persistent advocate of the use of salt solution in the peritoneal cavity, and have strenuously insisted upon the value in many ways accruing from it, I am in full accord with Ward in his statement that it is an important factor in the prevention of post-operative adhesions. His article is to be thoroughly commended, and action along the lines suggested in this paper will lead to the best post-operative results.

DISEASES OF THE BLOOD AND DUCTLESS GLANDS. THE HEMORRHAGIC DISEASES. METABOLIC DISEASES.

BY ALFRED STENGEL, M.D.

THE BLOOD.

Review of the Year's Progress. Comparatively little has been added to our knowledge of the blood diseases, so-called, in the course of the past year. Some facts of importance have been discovered in the morphological studies of corpuscles, and some added information on the chemistry of the blood has been contributed; but, on the whole, this side of hæmatology has been unproductive. To counterbalance this, however, very notable contributions have been made to the knowledge of the serum and its reactions. This subject is now becoming so complex that the time is almost ripe for a separate subdivision of serum diseases. As soon as a little classification is possible this will undoubtedly be done. The advances in serum pathology are referred to in the following pages, and need not be epitomized. Next in importance to this are the sections on the anatomy and origin of the blood plaques, and on the granular degenerations of the erythrocytes. To these three portions of his articles the writer would especially direct attention.

Methods of Examining the Blood. Few contributions of any importance have been added to previous knowledge of the morphology of the blood or of methods for examining it histologically or otherwise. All of the methods for determining the hæmoglobin of the blood or its richness in other respects are approximative, as has repeatedly been insisted upon in the volumes of *PROGRESSIVE MEDICINE*. The methods for determining the hæmoglobin, in particular, are subject to errors dependent upon the inadequacy of the methods themselves or the personal equation of the examiner. Recently, Cabot¹ and Henry T. Hewes² recommend the Tallquist method. Gaertner³ suggests a new proceeding which may have certain advantages over any of the older

¹ New York State Medical Association and Journal of the American Medical Association, November 9, 1901.

² Boston Medical and Surgical Journal, August 1, 1901.

³ Münchener med. Wochenschrift, 1901, No. 50.

ones, and undoubtedly eliminates personal equation to a large extent, but it is so difficult of accomplishment that we doubt if it can ever be adopted. This method, which he names hæmophotography, depends upon a comparison of the shadow produced on a photographic print paper by light passing through a layer of the diluted blood with the shadow of the Fleischl prism. The details regarding this method must be studied in the author's paper. The advantages claimed by him are: the ability of even the color-blind to practice the method, as density of the color alone is to be compared, and the possibility of preserving the record in the form of photographic prints for subsequent comparison with other records.

Staining of the Blood. The Romanowsky stain, which has many distinct advantages over the older methods, has been used very considerably by hæmatologists in the last year. Recently, Leishman¹ discusses the possibility of making this stain by a simple method. Two solutions are first prepared, and these are mixed in the following manner:

Solution A: A 1 per cent. solution of "medicinal methylene blue" (Gruebler) is made with distilled water, and then rendered alkaline by the addition of 0.5 per cent. of sodium carbonate. The solution is then heated to 65° C. in a paraffin oven for twelve hours, and afterward allowed to stand at room temperature for ten days before being used.

Solution B: Eosin, extra B. A. (Gruebler), 1 in 1000 solution in distilled water.

Equal volumes of A and B are mixed in a large, open vessel and allowed to stand for from six to twelve hours, being stirred from time to time with a glass rod. The abundant flocculent precipitate is collected on a filter paper and washed with distilled water until the washing is colorless or has only a faint blue tinge. The insoluble residue is collected, dried, and powdered. The resulting powder has a greenish, metallic lustre, and contains the active staining ingredient of Romanowsky's stain.

The dye prepared as above should be dissolved in methyl alcohol in the proportion of 0.15 per cent., and the solution kept in stoppered bottles until required. The solution is of a clear, dark-blue color, showing no deterioration on keeping.

Method of use: Prepare cover-glasses in the usual way. After the spread is made no fixing is necessary, the methyl alcohol acting as a fixing agent. After drying the spreads in air they are held in the ordinary forceps, and 3 to 4 drops of the stain are allowed to fall on the smear. Rotate forceps to insure an even distribution. After about

¹ British Medical Journal, September 21, 1901.

half a minute add twice as much of distilled water as the amount of stain employed—6 to 8 drops, and mix by rotating forceps. Stain for five to ten minutes, depending on thickness of specimen. Wash stain off gently with distilled water, and allow a few drops of the water to rest on the smear for one minute longer. This last is important.

The red cells appear pale pink or greenish in tint, and semi-transparent. Polynuclear leucocytes: Nuclear network is stained a deep ruby-red, with sharply defined margins; extranuclear protoplasm, colorless. Fine eosinophile granules, red.

Mononuclears: Nuclei, ruby-red, with extremely sharp, clear outlines. Extranuclear protoplasm, pale eau-de-Nil or blue, occasionally showing a few red granules.

Lymphocytes: Same as mononuclears, except that the nuclei are, as a rule, more deeply stained.

Coarse-grained eosinophiles: Nucleus ruby-red, but not so deeply stained. Granules, pale pink.

Basophiles: Granules very densely stained, of a deep purplish-black tint. Nucleus red, but usually more or less masked by the granules overlying it.

Nucleated red cells: Nucleus almost black, with sharp outlines; extranuclear portion, gray.

Blood plates: Deep ruby-red, with spiky margins, frequently showing a pale blue peripheral zone surrounding the red centre.

Malaria parasite: Body stains blue and its chromatin ruby-red; in the case of the tertian parasites Schueffner's dots are well-marked in the containing red cell.

Bacilli and micrococci: Generally speaking, they stain blue, but by prolonging the period of staining and by subsequently decolorizing with absolute alcohol many interesting details of structure can be brought out.

The advantages of the stain lie in the short time required to use and its wide range of application. Good results can be obtained on smears from bone-marrow, cancer juice, and from glands, such as the spleen and liver.

He lays stress on the part of the procedure when the stained film is allowed to soak in distilled water for a minute. This intensifies the stain, removes the deposit, and changes the tint of the red cell to pink.

Strauss and Rohnstein,¹ in discussing their results in a series of cases of blood examinations, state that great care must be taken in the preparation of blood films, and that for accurate results the two cover-glasses should be separately counted, as the upper cover-glass frequently con-

¹ Die Blutzusammensetzung bei den Verschiedenen Anämien, 1901.

tains 3 to 6 per cent. more leucocytes than the lower. Furthermore, the thin as well as the thick parts of the spread should be counted, as this influences the count very much. I have myself frequently observed the apparent effect of the thickness or thinness of the spread, and recall the statement of Fraenkel, who insisted upon the importance of the preparation of the spread in determining morphological characters. Frequently the apparent size of the leucocyte is dependent upon the thickness of the spread. In differential counting Strauss and Rohnstein advise enumeration of at least 400 leucocytes in four separate preparations. They suggest a new stain in the course of their paper :

Solution A.	Eosin, gelb (Gruebler)	0.5
	Alcohol, absolute	80.0
	Aqua, common	20.0
Solution B.	Rubin (Gruebler)	0.5
	Alcohol, absolute	80.0
	Aqua, common	20.0

The completed stain consists of 3 parts of solution A to 1 part of solution B. The blood slide after fixation (heat, alcohol and ether, formalin) is placed in the above stain for three minutes, washed well in water, and then placed for one minute in a 0.5 to 0.3 per cent. watery solution of methylene blue, which should be a week old ; then well washed in water, dried, and mounted. Red cells are stained a brick-red ; the nuclei and all other basophilic elements a marine blue ; the neutrophile granules take a bluish or brownish-violet shade, the eosinophilic granules a light red. The result is equally good if the preparation remains longer in either stain than the time given.

Iodophilia. This subject may perhaps be considered in this place as well as in any other, as the important feature connected with it is the staining reaction involved. Reference has been repeatedly made in these articles to the iodine reaction of the leucocytes, and the value of this reaction in connection with fever, suppuration, and the like has been discussed. The polymorphonuclear leucocytes are the ones involved, the lymphocytes and eosinophiles not being affected. The solution used in staining is one of iodide of potash 3 parts, iodine 1 part, and distilled water 100 parts. Gum-arabic is added until the fluid has a syrupy consistency. The dried smear is mounted in a drop of this solution and examined with an oil-immersion lens. A reddish-brown color in the polymorphonuclear leucocytes is an indication of the glycogenic infiltration indicated by the reaction. When several such cells are found in a search of the cover-glass, iodophilia may be said to be present. Dunham¹ has recently discussed this reaction, and refers to previous

¹ Boston Medical and Surgical Journal, June 13, 1901.

contributions. He states that the condition has been found in connection with suppuration that has not been walled off, and that was not of tuberculous character, as well as in pneumonia. Hofbaur has also found it in pernicious anæmia and leukæmia as well as in grave anæmias of gastric cancer and chronic intoxications. He failed to find it in eighteen cases of chlorosis. Dunham has also found the condition in connection with leukæmia. As none of the conditions named are likely to be confounded with pneumonia or suppuration, Dunham believes the reaction of some value; others, however, have found iodophilia in connection with fever and independent of suppurative processes, so that the confidence the author places in the reaction seems to us scarcely merited.

Locke and Cabot¹ have also made a study of iodophilia, calling attention to the fact that this reaction, first recognized by Ehrlich in 1883, was thought to be due to glycogen. Two types of the reaction may be distinguished: First, an extracellular form, in which round or oval masses, 2 to 8 microns in diameter, may be seen outside of the cells, grouped, as a rule, in masses and suggesting broken-down leucocytes.

This type is found in the normal blood. Second, the intracellular type, which is usually found in the neutrophile cells. The granules are regular in shape and size, and occasionally the staining is diffuse instead of granular.

Basophilic cells are less frequently affected. The authors have never found the eosinophiles affected. They have studied 432 cases. In each case 100 white cells were studied, and if no iodine reaction was seen in any cell the case was regarded as negative. Increase of extracellular masses was considered pathological, but the mere presence of intracellular reaction is always pathological.

Results. 1. Like leucocytosis, fever, and the diazo reaction, iodophilia signifies not a special disease or condition such as abscess, but a general toxæmia such as might be produced by abscess, gangrene, uræmia, or malaria. Though more constantly positive in the presence of pus than with other conditions, we cannot make a diagnosis of sepsis or of a purulent accumulation from this reaction alone.

2. Iodophilia is not identical with, neither does it coincide in its indications with, any of the ordinary physical signs, as leucocytosis, fever, etc.

3. It appears to be certain evidence of disease. The authors have never observed the sign in any but severe cases, and believe it to be more reliable in this respect than either leucocytosis or fever.

¹ Journal of Medical Research, January, 1902.

4. A positive reaction occurs with considerable regularity in—
 - (a) Infections with pyogenic organisms, whether local or general.
 - (b) Toxæmia of bacterial origin, as in diphtheria and typhoid fever.
 - (c) Non-bacterial toxæmia, *e. g.*, uræmia.
 - (d) Disturbances of respiration.
 - (e) Grave anæmia, both primary and secondary.

5. In their experience, the sign has been absent in pleurisy, rheumatism, extra-uterine pregnancy, alcoholism, abscesses with free drainage, lead-poisoning, early malignant disease, nervous conditions, and tuberculosis if uncomplicated with secondary infection. The author calls attention to the ease with which a blood examination is made by this method. Any change in the red or white corpuscles, the presence of malarial organisms, and a differential count can be determined from the same slide. In connection with the subject of iodophilia investigations or other changes in the staining qualities of the leucocytes a paper of interest is that of Hirschfeld,¹ who found decided alterations in the staining relations in certain diseases attended by fever and leucocytosis.

While showing no structural change by the tri-acid stain, when a solution of methylene blue was employed the normally neutrophilic granules took on a distinct blue tinge. These blue-stained granules resemble the neutrophilic granules in size and shape, and generally in their distribution. Occasionally only a portion of the protoplasm shows the change, or the granules are arranged in groups.

In a study of the leucocytes in the diseases of childhood, Dr. C. Y. White and the writer occasionally found basic granules in the polymorphonuclear leucocytes very similar to those here reported; indeed, some of the most striking basophilic leucocytes that we have seen occurred in the polymorphonuclear cells.

The diseases in which this change has been noted by Hirschfeld are pneumonia, measles with bronchopneumonia, scarlet fever, and phthisis with high fever—conditions in which a leucocytosis is present. In typhoid and in measles without complication he could not find the change. This change is not constant, as he met an occasional case of the above diseases in which the reaction with methylene blue failed to appear. The solutions used were a methylene blue solution 1 to 250, a concentrated solution of methyl green (watery), and a concentrated watery solution of saffranin. The author looks on this “basophilia” of the neutrophile granules as an evidence of the youth of the cells.

A second change that he finds in all of the infectious diseases accompanied by high fever is as follows: In specimens stained with methylene blue or methylene blue and eosin, in the protoplasm of the neutro-

¹ Berliner klin. Wochenschrift, 1901, No. 29.

phile leucocytes, between the cell wall and the nucleus or close to the cell wall, are found one or more ball-shaped or ovoid bodies that take a weak blue color. By the triacid stain these are not visible. He does not know whether these bodies represent protoplasmic or nuclear degeneration, or if they are centrosomes.

Blood Plaques. The blood plaque has been and has remained the enigma of hæmatology. All knowledge regarding the structure and the production of these formations has been fragmentary and unsatisfactory, and the views entertained by some with more or less confidence regarding the relation of blood formation have been purely hypothetical. The French school of hæmatologists, under the leadership of Hayem, maintain even to the present time the rôle of the blood plaque in the formation of the blood corpuscles; but the facts upon which these views are founded are meagre and unsubstantial. The recent tendency has been toward a recognition of degenerative processes as the cause of origin of these corpuscles, and the investigations of Deetjen¹ are particularly instructive. His method of examining the fresh blood has been, first, to prepare a solution of agar in the following manner: 5 grammes of agar are dissolved by boiling for one-half hour in 500 c.c. of distilled water. The liquid is filtered while hot, and to each 100 c.c. is added 0.6 gramme of common salt and 6 to 8 c.c. of 10 per cent. solution of NaPO_3 . The latter must be prepared without heat, as heat will change the phosphate to an orthophosphate. Finally, 5 c.c. of a 10 per cent. solution of K_2HPO_4 are added. A small amount of the agar is placed on a glass slide and allowed to cool. A portion is scraped away, leaving a depression into which a drop of blood is put and covered with a cover-glass and examined at a temperature of 40°C . Corpuscular motions are retained in such a preparation at a temperature of 40°C . for some time. To fix the specimens Flemming's solution or osmic acid may be run under the cover-glass. In preparations of this sort the blood plaques appear as round or oval disks, but show amœboid movements comparable to those of the leucocytes. These begin slowly, but increase in one-half hour; when at their height two distinct portions are visible in the blood plaque—an inner, light, strongly refractive, and greenish portion, and an outer, clearer portion, from which pseudopods or pointed projections are thrown out. This portion is in constant motion, and is of a paler, clearer character than the interior. The motions are exceedingly lively, and during their activity the blood plaque can be seen to move about. The preparations at room temperature, protected from evaporation, readily show the same activity, and the author concludes that these are true amœboid movements.

¹ Virchow's Archiv, Band clxiv., 239.

While I am not prepared to doubt the conclusions of the author regarding the observations, certain very erroneous deductions might be drawn. Very similar appearances have arisen in my own studies of the fragmentation products of red corpuscles. In this case there was no question but that the structure under observation was an artefact produced by different chemical, mechanical, or thermal impressions. I frequently found small bodies breaking from the periphery of the red corpuscle after an apparent extrusion from the interior through a break in the periphery, and these bodies moved in the plasma with more or less activity, and often showed changes in their contour. I have seen similar extrusions from the periphery of the *amœba coli* and other protozoa. It was not to be assumed, however, that the resulting formations were distinct cellular forms like leucocytes, for example, and it is from this point of view, it seems to me, the observations of Deetjen might lead to erroneous conclusions. Though presenting some amœboid movements like the leucocytes, there is nothing in his observations that seems to me to warrant the conclusion that the blood plaques are cellular species and not merely productions of degeneration. His agar preparation, with its phosphatic components, might easily, through chemical action, cause the changes I refer to. Dorendorf and Hamel,¹ however, believe that the theory of Deetjen is correct, and that the blood plaques are distinct cellular formations, with a protoplasmic body capable of amœboid motion and a nucleus with distinctly differentiated structure. Regarding the nucleus, Deetjen showed that in specimens fixed in the way already described, by immersing a blood film in 96 per cent. alcohol for one or two minutes, or 0.5 per cent. formalin from three to five minutes, the inner body takes the hæmatoxylin stain and the outer portion stains with protoplasm stains. The inner body, corresponding to the refractive substance seen in the living cell, takes the hæmatoxylin when no degenerative changes have occurred. It appears as a centrally placed, or slightly eccentric, rounded body. He thinks that it is difficult to say whether this is a true nucleus or a heaping up of the chromatin (?). The smallness of the object and the slight resistance of the nucleus to outside influences make the study of its finer structure difficult, but under a high power he found it composed of rows of fine granules. To stain the individual threads of chromatin he found the best method was to fix with Flemming's solution and stain with methylene blue or iron hæmatoxylin after Heidenhain's method. He has not been able to demonstrate a nuclear membrane.

It does not seem to me that the evidence justifies the assumption that the body described is a cell composed of protoplasm and a nucleus.

¹ Münchener med. Wochenschrift, November 12, 1901.

All the extrusion bodies to which reference was made above show a similar differentiation of protoplasm.

Deetjen gives certain changes which he records as evidences of destruction or death. The plaque becomes pale, swells up, or changes to a long-drawn protoplasmic thread. The interior highly refractive portion breaks up into granules, and sometimes vacuoles may be observed. These changes, again, are so like those which I have repeatedly observed in artificial fragmentations of the red corpuscles that the similarity must be referred to. For a long time my thoughts have turned toward the red corpuscle as the most probable source of the blood plaques, and instead of disproving this view I find in the work of Deetjen a confirmation of it. Hans Hirschfeld¹ comes to the same conclusion regarding the origin of the blood plaque. Most of his work was carried out with dried preparations of blood which were fixed with heat and stained in eosin and methylene blue or eosin and hæmatoxylin. In almost any specimen of blood one may find certain red cells that are apparently the site of origin of blood plaques. At most the author has seen three such cells in one field. In the centre of these red cells is seen an oval, round, or elliptical disk, stained a faint blue and not sharply defined from the surrounding cell. The largest number found in a single cell was four. These he calls "endoglobular" plaques, while for the red cells containing the plaques he suggests the name of "blood-plaque-holding cells." The disks in the red cells are extruded to form the ordinary plaque. The author claims to have seen this extrusion in all stages where the disks approach the periphery of the red cell, where the outline of the cell shows a bulging, where the disks have broken through and lie outside, and where a portion of the disk lies inside and another portion lies outside, the two being connected by a small bridge, etc. From the leucocytes the author has seen similar disks formed which he thinks are also blood plaques. Both multinuclear and uninuclear leucocytes, but especially the latter, can give rise to the disks. First appear processes resembling pseudopods, which are separated by constriction, forming the basophile disks. This is especially marked in leukæmia. The blood plaques differ from those formed in the usual way in that they lack a bright spot that may be seen in the plaques derived from the red cells. The author suggests that the plaques are a result of the degeneration of the so-called "inner body" of the red cells; red cells containing no "inner body" have already given up their plaques; the "plaque-holding" cells are an old form of red cells, which accounts for their not being found in the bone-marrow.

¹ Virchow's Archiv, Band clxvi., Heft 2.

These observations correspond very closely with those I have myself made. The discovery of small bodies originating from the leucocytes is interesting in connection with some extrusions from unicellular organisms like amœbæ. I believe that practically all free cells in unfavorable surroundings of certain kinds will extrude portions of their protoplasm. Hirschfeld followed the method of Deetjen, and found that he could develop more plaques in this way than he saw in the fresh blood; but, like ourselves, he cannot accept the conclusion of Deetjen that the plaque consists of a nucleus and protoplasm, though he quotes Argutinsky, who found a nucleus and protoplasm by using the Romanowsky stain.

Practical Value of Hæmatology. This must be tested by the usefulness of blood examinations in the diagnosis or treatment of diseases. Practitioners have sometimes been disposed to underrate the value of such examinations, and, on the other hand, hæmatologists at times have claimed more than could be readily proved. The difficulty in many instances lies in the fact that authors do not sufficiently recognize the circumstances which may alter the character of the blood in health, and therefore lay great stress upon fluctuations in cases of many diseases without reference to trivial circumstances, such as have been alluded to. Diet, exercise, heat, cold, and influences of this sort—all are potent, and must be taken into account. While blood examinations are of great interest to physicians, they are even of greater interest to surgeons, because upon the condition of the blood very often depends the determination of the necessity for operation. It is especially necessary, therefore, that attending conditions be kept in mind and their influence upon the blood-count thoroughly appreciated. Some of the earlier writings are of little value because this has been neglected. In recent contributions scrupulous care has been taken to estimate every possible influence. A paper of importance in this connection is that of C. H. Frazier and T. B. Holloway,¹ who report the condition of the blood in forty operative surgical cases. Their results may be summarized as follows:

Hemoglobin. They found but little change. In the few malignant cases included the results seemed to agree with those of Cabot (see below), the regeneration of the blood taking place in a normal manner.

Erythrocytes. They found the red-cell count high in almost all cases. This count was taken just before operation, and its alteration from normal is attributed to the effect of the preparation restricted diet and purging causing a concentration of the blood. A high red-cell count was also found after operation, and is attributed to the effect of hemor-

¹ University of Pennsylvania Medical Bulletin, December, 1901.

rhage (regenerative change) ; the vomiting and sweating and restriction of liquids incident to the taking of ether.

Leucocytes. They found the average number of white cells was increased in all their cases, both where the knife was used and in those cases where ether was given for cystoscopic examination, breaking up of adhesions, etc. This increase they do not think is due to the effects of the ether, or if ether does have an effect it is slight and transitory.

The time required for the white cells to return to their normal number in uncomplicated cases was three and one-half days. (In laparotomies C. Y. White found five days were required ; Cabot gives thirty-six hours as the limit ; Bloodgood (see below) thinks the cells are normal in about twenty-four hours.)

There seemed to be a relation between the extent of the operation and the leucocytosis, the cases in which the dissection disturbed a considerable amount of tissue having a more marked grade of leucocytosis. There was no apparent relation between the temperature and the leucocytosis. It is probable that the same conditions that cause the increase in the temperature may tend to an increase in the number of white cells.

Conditions affecting the return of the white cells to the normal number : Here are mentioned (1) dressings and removal of drainage ; (2) imperfect drainage ; (3) infection within the wound ; (4) infection without the wound. As an example of this is given the record of a case where, in spite of a normal healing of the wound of operation, the leucocytic count remained high. A phlebitis that developed shortly after proved to be the cause.

The authors insist on the value of blood examinations to the surgeon, but point out that a continuous record from the time of the admission of the patient should be kept, in order that the changes occurring can be properly appreciated. The isolated count is often of little value.

Bloodgood¹ has also discussed this subject, and refers in particular to certain conditions :

1. *Shock and Hemorrhage.* Observations have demonstrated that there is a leucocytosis of 15,000 to 24,000 following hemorrhage. As a rule, this comes on in a few hours. The relations between the amount of blood lost and the leucocytes, and leucocytic changes in shock without hemorrhage, have not been demonstrated. In severe hemorrhage the blood-count will indicate to a certain extent the blood lost, but, as a rule, not until six or more hours later. Following hemorrhage there is an increase in leucocytes, diminution in red cells and hæmoglobin.

2. In marked *anæmia*, especially if the hæmoglobin is low, there are enough observations to prove that general anæsthesia, especially if pro-

¹ Maryland Medical Journal, September, 1901.

longed, is dangerous. The majority of surgeons agree that 30 per cent. marks the lower limit of safety. The author agrees with this.

3. *Post-operative Leucocytosis.* There is need for more study on this. Most authorities agree that there is perhaps a slight increase in white cells after ether, which disappears within twenty-four to thirty-six hours. After operation where much blood is lost there is a temporary leucocytosis; but, on the whole, in the average operation one should expect the leucocytes to be normal twenty-four hours after operation. (This statement, however, does not agree with the experiments of White, Frazier and Holloway, Cabot, and others.) Thus, if this is true, post-operative leucocytosis would indicate a complication. A leucocytic count as a means of post-operative diagnosis is most certain in the early recognition of intestinal obstruction. Here there is always a rise, usually over 20,000. This rise takes place within eight to twenty hours of onset, and has been prominent in a few cases before the clinical signs were apparent. The observation goes to show that the nausea, vomiting, and distention after laparotomy, not due to actual obstruction, do not cause a rise above 12,000 to 15,000. He thinks this important.

4. *Importance of the Leucocytic Count in the Early Recognition of Acute Abdominal Lesions.* "When observed within forty-eight hours the number of leucocytes is, in a majority of instances, of great value, indicating the extent of the inflammatory condition of and about the appendix."

Chronic and Subacute Appendicitis. Sixteen cases, seen usually at the end of the attack; symptoms subsiding. Highest count, 15,000. No pus found in any.

Acute Appendicitis. No operation; recovery. In these cases leucocytosis is not high, and falls rapidly. The author believes in operation in cases seen within forty-eight hours where the leucocytosis is above 20,000.

Cabot, Blake, and Hubbard discuss the results in a number of surgical cases in which the blood counts of their house doctors were utilized. They found that anaesthesia itself produced an increase in the leucocyte count. Of 50 cases 13 showed an increase of more than 2000 after full anaesthesia, and 7 cases showed an actual diminution. In 7 cases, all of them involving the abdomen, there was considerable leucocytosis. These results contrast somewhat with those of Chadbourne,¹ who found an increase of leucocytes in every one of 21 cases, the average increase being 37 per cent. Further, this author noted that the leucocytes were most increased during the early part of etherization. He believed that this increase of leucocytes which affected all varieties was due to infec-

¹ Philadelphia Medical Journal, February 18, 1899.

tion of the respiratory tract by the vapor. Cabot and his associates conclude from their studies that there is little, if any, leucocytosis in the period of full etherization and just before operation, while after the operation there is not infrequently a moderate increase in the white cells. This increase amounted to 2000 or more leucocytes per c.mm. in 35 out of 47 cases, and 3000 or more in 27 cases. In 5 cases there was an actual decrease in the leucocytes. They believe that the operation itself has the effect of increasing the leucocytic count in about one-half of the cases. In 10 of their cases it was found that thirty-six hours after the operation the leucocytosis had disappeared. In 7 of these 10 cases the count was lower the day following the operation than on the morning of the operation.

In a study of the effect of fractures they found among 23 cases of simple fracture a leucocytosis above 10,500 in 10 cases; above 12,000 in 6 cases. The highest counts were 15,400, in a case of fracture of the pelvis, and 15,000 in a fracture of both bones of the legs with symptoms suggesting fat embolism of the lungs.

Like Frazier, the authors found that after operations for malignant disease the blood returns to its normal condition. These authors deny, therefore, the statement of Bierfreund,¹ who claimed that after operations for malignant disease the hæmoglobin never reaches the point at which it was before operation. In 13 cases Cabot and his associates found the result contrary to this statement.

Blood counts in cases of typhoid fever made from hour to hour have been vaunted as of great value in presaging the occurrence of perforation, and a short wave of leucocytosis has been claimed as the indication. The authors, however, have found that conditions other than intestinal perforation, and perhaps even trivial circumstances in the care of the patient, bring about changes that might be misinterpreted. Thus in a convalescent from typhoid they found slight leucocytosis disappearing within an hour, and in a healthy subject during a day or hourly count they found sudden and wide fluctuations. In view of such experience in 10 cases, 4 being of typhoid fever, they conclude that it is unsafe to base any inferences on the temporary wave of leucocytosis. I can confirm this statement from my own experience, for in a large number of cases of typhoid fever under my care during the past summer frequent and sometimes hourly counts were made when perforation was suspected. In no case did the blood count aid us much in the diagnosis. Generally the number of leucocytes remained low or even sank lower at or before the time of the perforation.

The influence of severe muscular exertion was studied by Cabot and

¹ Langenbeck's Archiv, vol. xli.

his associates in 4 of the Marathon runners. There was an increase of from 3700 to 28,000 leucocytes in 1 of the cases. There was a polymorphonuclear leucocytosis in 3 out of 4 cases, and an entire absence of eosinophiles in 3 out of the 4.

Finally, the same subject is taken up by J. Chalmers Da Costa and Kalteyer,¹ who report the blood changes in 50 operative cases. Like other recent authors, they note that many factors influence the number of leucocytes. There is generally a polycythæmia, rarely an oligocythæmia after anæsthesia. The polycythæmia is due to a lessening of the watery elements of the blood from preparation of the patient and other causes, and not to increased formation of red corpuscles. An increased number of leucocytes at the termination of anæsthesia is mainly due to the increased number of red corpuscles, subsequently the effect of the anæsthesia. The withholding of diet, the use of cardiac stimulants and other factors operate in the same direction. The polycythæmia is usually still present some time after operation, though, as a rule, nature adjusts the use of solid and watery elements very frequently.

They found an absolute reduction of hæmoglobin in all cases; sometimes there was an apparent increase in the percentage of hæmoglobin, but this was never parallel with the increase of red corpuscles. The individual corpuscular richness, therefore, is reduced. This reduction in the color index is especially striking when contrasted with that obtained in the same patient some time before operation. They conclude that ether produces hæmolysis, and that immature red cells are present in the circulation. Hemorrhage during and after operations influence the conditions of the blood profoundly. Referring to the limit of 30 per cent. of hæmoglobin adopted by Mikulicz as the lowest limit at which operation should be attempted, they express their agreement. They further urge that when operation can offer no chance of recovery or even considerable prolongation of life, it should not be performed in general anæsthesia if the hæmoglobin is below 50 per cent. They report one case in which anesthetization was successful, though the hæmoglobin was 30 per cent. and another 24 per cent., but these exceptions do not vitiate the rule. Practically, all advanced surgeons are in agreement about this rule, and I would indorse it from my own experience.

As a consequence of these reflections, the authors very wisely suggest that when the hæmoglobin is low the ordinary preparations for operation should be minimized in their severity and as much hastened as possible.

Leucocytosis as an Antecedent of Typhoid Perforation of the Bowel. Russell² has reached rather the opposite conclusions from those

¹ *Annals of Surgery*, September, 1901.

² *Boston Medical and Surgical Journal*, April 18, 1901.

of Cabot (see before) regarding the value of leucocytosis as an indication of perforation, and conclusions very different from my own. Of course, it will not be surprising to anyone that leucocytosis develops in some cases of perforation when peritonitis has set in. This, however, is of no value in the diagnosis of the condition, as clinical signs of much greater value will have appeared before that time. The important point to be determined is whether Cushing's claim that there is a preperforative leucocytosis will be borne out by experience. I have no doubt that in some cases in which an extension of the infection has taken place through the wall of the bowel, and a patch of peritonitis exists opposite the ulcer, leucocytosis may develop before the bowel actually ruptures; but there is not always this extension, and, therefore, reasoning from general principles, I should doubt the value of a preperforative leucocytosis. My practical experience, as I have said before, has been totally opposed to it.

Russell made leucocytic counts in 37 cases of uncomplicated typhoid and found the counts to vary between 2000 and 12,000 per c.mm., an average of about 6500.

In Case I. indefinite symptoms of perforation appeared on the tenth day. The blood counts showed a leucocytosis of 28,000. Operation revealed the perforation, and the patient recovered. Two days after operation the white cells were 19,000, and two weeks later 9000.

Case II. Signs of perforation were definite. Blood counts showed, twelve hours after the onset of the perforative symptoms, only 12,000 white cells. Operation revealed the perforation; recovery.

Case III. In this case the blood count, made on the sixteenth day of the disease, showed 6100 white cells and no abnormal signs. Four days later the symptoms of perforation developed, and the blood count now showed only 4800 white cells. Operation revealed a perforation; death.

Case IV. On the fourteenth day the patient developed pain and rigidity in the abdomen, and two blood counts made showed 16,000 and 13,000 white cells, an average of 14,500. Operation discovered no perforation or signs of peritonitis; a blood count on the day following the operation showed an average of less than 10,000 white cells in the three counts. The patient recovered.

Case V. On the seventeenth day pain suddenly developed in the right iliac fossa, accompanied by tenderness and rigidity. Three counts made two hours apart were 17,000, 14,000, and 10,500, respectively. Operation revealed two intensely swollen ileo-caecal glands, but no perforation; recovery was uneventful.

Case VI. This case presented very indefinite signs of perforation and a leucocytic count of between 12,000 and 14,000, made every three

hours for thirty-six hours. About this time the patient suddenly collapsed, and distinct signs of peritonitis appeared. The leucocytosis suddenly rose to 32,000 ; operation was followed by death.

In regard to the behavior of the white cells in other complications in typhoid the author reports the following: In a simple bronchitis along with typhoid he found 20,000 white cells ; in cholecystitis there were 13,000 ; in one of mild middle-ear disease, 13,000 ; in a case complicated with general sepsis there were 13,000.

Conclusions. 1. That in perforation it is the general rule to have a leucocytosis, the degree of this may vary within wide limits.

2. That the leucocytes, while appearing as a rule early, may not be at all marked until the general peritonitis and collapse have supervened.

3. That there may be an utter absence of leucocytosis, with marked perforation and peritonitis ; in fact, the cells may be lower than normal.

4. That with typical signs of perforation and a definite leucocytosis there may be no such complication present, and an operation may be performed unnecessarily.

5. That a marked degree of leucocytosis may occur in complications other than perforation ; for example, bronchitis, cholecystitis, etc.

6. That pain and tenderness in the abdomen, coming on suddenly during an attack of typhoid fever (and in the absence of evidences of cholecystitis or other definite complication) and a distinct leucocytosis, even without other signs of perforation, an exploratory operation is justified, even advisable, thereby obviating the dangers of a fatal issue from too great a delay. The exploratory operations in Cases IV. and V., done unnecessarily, resulted in no bad consequences, and the patients made a satisfactory recovery.

The Influence of Hemorrhage on the Leucocytic Count has been studied by George D. Head.¹ The results of his study confirmed previous views. The author's experiments were carried out on dogs. A primary leucocytic count was made, and then the dog was bled. A second count was made within two to five minutes after. The results :

	Two to five minutes before bleeding.	Two to five minutes after bleeding.	Twenty-four hours later.
Dog 1	9,600	6,300	26,300
" 2	6,600	2,600	15,600
" 4	14,000	10,300 48 hours later	16,000
" 5	13,600	5,000 " " "	10,000

Dogs 4 and 5 had been bled previously, which accounts for the primary leucocytosis. The author's conclusions are as follows :

¹ Journal of the American Medical Association, August 24, 1901.

1. In dogs a diminution in the number of white cells in the circulating blood immediately follows a profound hemorrhage.

2. This initial leucopenia is followed sooner or later by an increase in the number of leucocytes in the circulating blood. This is the so-called posthemorrhagic leucocytosis of all writers.

The blood of these dogs was examined for seven successive days, with a view of determining at what time the normal count was regained. In seven days two dogs had normal counts; the others were yet high. The author thinks the above is true of the effect of hemorrhage on man.

Digestive Leucocytosis in Cancer and Ulcer of the Stomach.

Rencki¹ has studied this interesting question in 15 cases of gastric cancer and 14 cases of gastric ulcer, with the following results:

1. During digestion of albuminoid bodies there appears in the majority of cases an increase in the white cells or a digestive leucocytosis.

2. The height of this appears usually in the third or fourth hour, and amounts on an average to 3543.

3. Its appearance is dependent on the normal function of the pylorus and the intestines.

4. The lessening of the digestive leucocytosis in pathological conditions of the digestive tract is produced by the disease interfering with the normal function of the pylorus and intestines.

5. The presence of digestive leucocytosis affords no diagnostic evidence in doubtful cases of gastric cancer or gastric ulcer, for it can appear in either condition, and is not dependent on the nature of the disease.

6. The failure of digestive leucocytosis in healthy individuals may be attributed to a weakness in the contractility of the pylorus, which gives rise to an insufficiency of the same.

In a study of the conditions of the blood in various diseases, Strauss and Rohnstein² reported upon 35 cases of carcinoma, 17 of which were uterine, 7 gastric, 4 cesophageal, and the remaining cases of other distribution. Leucocytosis was present in 28 of the 35 cases; the degree of cachexia having no importance in this direction. In the cases of carcinoma of the stomach the number of leucocytes was of no special value in diagnosis. The differential count in carcinoma showed a predominance of polymorphonuclear forms, increasing with the degree of cachexia. In a few instances the lymphocytes were increased owing to an involvement by metastases of the lymphatic glands. In most instances the lymphocytes progressively decreased in proportion to the

¹ Archiv f. Verdauungskrankheiten, Band vii., Heft 3, 4, und 5.

² Die Blutzusammensetzung bei den Verschiedenen Amämien., 1901.

increase of cachexia. The progressive diminution in the mononuclear elements, and especially the lymphocytes, which they believe is established, forms a direct contradistinction from the conditions in pernicious anæmia, and therefore has diagnostic value. In 9 cases of anæmia following septic infection there was leucocytosis in 8, and a normal count in 1. Rieder¹ has stated that an increase in leucocytes may appear without the occurrence of an exudation, while Limbeck claimed that only in the presence of exudation and fever leucocytosis occurs. The authors agree with Rieder in this matter. The differential count showed an increase in the polymorphonuclear elements and a decrease in lymphocytes. In one case there was eosinophilia (7.6 per cent.). These were mononuclear eosinophiles. The case was one of osteomyelitis. In the other cases the eosinophiles were reduced in number or normal. In 2 cases myelocytes were found, the 1 case being osteomyelitis. The average number of red cells was 3,047,000; the lowest, 1,890,000. Nuclear red cells were found in 3 cases. Megaloblasts were present in 2 of the cases. The hæmoglobin varied between 20 and 60 per cent., and was proportionately much lower than the red cells. The color-index averaged 0.69 per cent. In cases of anæmia following hepatic disease they found no conditions of special importance.

The Blood in Childhood. Authors of text-books on hæmatology are accustomed to consider separately the condition of the blood in childhood. As a matter of fact, there are certain differences in the reaction of the blood to various diseases in childhood and in later years. The tendency to leucocytosis is much more pronounced, in accordance with the general principle that cellular processes are more active in the young. The differential count shows a predominance of lymphocytes in many conditions in which, in adults, polymorphonuclear elements would be more conspicuous. Nucleated red corpuscles appear under slighter provocation, and profound anæmia attends conditions which, in the adult, would provoke little change. Stengel and White² discuss the conditions of the blood in the various diseases of childhood. They estimated the hæmoglobin (Fleischl), enumerated the red and white corpuscles, and determined the differential count of leucocytes in each case, and often repeatedly. They employed eosin and hæmatoxylin, Canon's stain, and Ehrlich's triple stain, and fixed the specimens with heat, mixtures of alcohol and ether, solutions of bichloride of mercury, picric acid, etc. The results may be summarized as follows:

RED CELLS. They found no practical differences in the morphology of the erythrocytes from that seen in the adults, although polychro-

¹ Beiträge zur Kent. der Leukocytose, Leipzig, 1892.

² University of Pennsylvania Medical Bulletin, November, 1901.

matophilia and irregularities of the size and shape of the red cells were, perhaps, more conspicuous in the moderate anemias, and nucleated red cells were found in some cases where the degree of anemia would not have led one to expect them in an adult. In no case was granular basic degeneration observed.

LEUCOCYTES. Certain peculiarities were here observed. There was a decidedly greater tendency to take the basic stain than the writers had met with in adult blood. The lymphocytes stained with Canon's mixture in many cases presented a coarse granular protoplasm, while the nucleus stained a light blue. Occasionally this granular character assumed the appearance of distinct granulations, and in some instances these granulations were extruded from the cell, projecting as little knob-like masses. These, of course, suggested artefacts; but if so, the occurrence of the coarse granular bodies in the protoplasm indicated that there was, before the extension, a differentiated condition of the protoplasm, and that the extruded particles represented preformed elements and not artefacts pure and simple. In the large mononuclear cells they found in a number of instances minute basic or amphophilic granules. Even when amphophilic, these inclined rather to the basic than acid affinity. These granules were closely set, giving to the protoplasm a fine, dusted appearance. Coarse basophilic granules were occasionally found in these cells, but never distinct mast-cell granules. The polymorphonuclear cells in a few instances contained very sharply defined and quite abundant basophilic granules. These were larger than the neutrophile granules usually observed, but were smaller than mast-cell granules. They stained with great intensity and gave the cell a striking appearance. Mast cells were found in some instances, but were not in any case abundant. Upon the whole, the basophilic granules were much more conspicuous in the blood of childhood than they have usually been found in the blood of adults.

Myelocytes were found in 10 out of 49 cases, but there was no significance in their occurrence. A case of pneumonia terminating fatally had 2.2 per cent.

The blood counts in general showed no striking peculiarities. The number of leucocytes was usually high compared with the adult, excepting in a case of typhoid fever where leucopenia was found.

PNEUMONIA (7 cases). Myelocytes occurred in 5; in Case II. there were 2.2 per cent., but the child was rachitic. Nucleated red cells were found in 2 cases, in one of which the nucleus showed karyokinetic changes. Eosinophiles were found in but 2 cases, and then during the course of the disease. Leucocytosis was present in all.

TYPHOID FEVER. There was an absence of leucocytosis in 6 out of 9 cases. In 3 cases in which it was present it could be explained by

the existing complications (severe bronchitis, pneumonia, pertussis, and varicella). Differential counts were not characteristic except that myelocytes occurred in 3 cases.

PERTUSSIS (3 cases). There was leucocytosis in all 3 cases ; especially striking was the marked increase of lymphocytes, which may be of interest in connection with the supposed disease of the lymph glands in pertussis.

VARICELLA (4 cases). Two cases showed no increase of leucocytes. One case which afterward developed pneumonia showed 19,360. One case, uncomplicated, showed 12,800 white cells.

BRONCHITIS (7 cases). The moderate number of leucocytes was here the most notable condition. All were above 10,000, varying between 12,691, the lowest, to 19,226, the highest. Possibly some patches of bronchopneumonia were present, though none could be classed as pneumonia in the strict sense.

ENTERITIS (4 cases). One case due to oxyuris showed 9499. The other cases (Case I., with bloody stools, also vaginitis ; Case II., with enlarged glands and marked inanition ; Case III., general malnutrition, enteritis shown by autopsy) showed a leucocytosis. In all the red cells were over 4,000,000 per c.mm., and the hæmoglobin over 65 per cent.

MITRAL DISEASES (2 cases). Red cells normal in both. White cells increased in both (13,658 to 20,587).

RHACHITIS (2 cases). The large proportion of lymphocytes and mononuclear cells was the notable feature. Case I., mononuclear, 18.4 per cent. ; lymphocytes, 36.6 per cent. ; total leucocytes, 11,911. Case II. Mononuclear, 19.6 per cent. ; lymphocytes, 34.5 per cent. ; total of leucocytes, 29,557.

TUBERCULOUS CARIOS, WITH COLD ABSCESS (1 case). Showed leucocytosis of 20,579. The stained specimen showed the red corpuscles somewhat distorted ; several polymorphonuclear cells had basophilic granules, and the differentiation of the mononuclear cells and lymphocytes was difficult.

ACUTE RHEUMATISM (1 case). The white and red cells were normal in number ; vacuolated mononuclear and polynuclear leucocytes were found in the stained specimen.

NOMA (1 case). The day before death the leucocytes numbered 12,144 ; previously they had been below 10,000. On final examination of stained specimen, made the day before death, the red cells were irregular in size and shape, stained unevenly, and there was slight polychromatophilia. Megalocytes were present, and all forms of leucocytes showed basophilic granules by Canon's stain.

PLEURAL EFFUSION (1 case). There were 13,600 leucocytes, 37.2 per cent. polymorphonuclears, 34.5 per cent. mononuclears, 27.1 per

cent. lymphocytes, 1.2 per cent. eosinophiles. Some megaloblasts and microcytes were seen.

ECZEMA (1 case). Three examinations were made, each showing a leucocytosis. The eosinophiles were slightly increased (7.9 to 5.7 to 7.8 per cent.).

CHRONIC MENINGITIS (1 case). Symptoms of meningitis were doubtful. Patient had been taking iodine and showed symptoms of iodism. Red cells, 5,412,000; leucocytes, 21,333; hæmoglobin, 85 per cent.; specific gravity, 1068.

The authors did not pursue the determinations of specific gravity which they began in the earlier part of their study, because, in many instances, it was difficult to obtain sufficient blood and the circumstances of the study did not permit it.

Specific Gravity of the Blood in Childhood. Schiff¹ has made special study of the specific gravity in childhood, determining it twice daily by means of a pyknometer. All precautions were taken to insure accuracy by having the instruments dried and avoiding a meniscus at either end. The pyknometer was 10 c.c. long and 1 mm. in diameter. The weights were obtained with a balance turning with 0.1 mg. The blood was taken from the great toe between 6 and 8 A. M. and 6 and 8 P. M., and as nearly as possible under the same conditions in each case. Referring to the number of cases:

1. As to the specific gravity alone, there were 58, with 834 separate estimations.

2. Of these 58 cases he studied 33 per cent. of them as to the physiological behavior of the specific gravity. (509 separate estimations.)

3. Seventeen cases had icterus neonatorum, and are spoken of separately.

4. Cases in which pathological conditions appeared—8 in number—were not included.

5. Twenty cases had the hæmoglobin estimated at the same time as the specific gravity. (250 separate estimations; Fleischl instrument.)

6. In some cases (number not given) the red cells were counted. (63 separate estimations.)

Their results were as follows:

1. The specific gravity of the blood of the newborn shows individual variations in the absolute worth. It varies in the first ten days between 1080 and 1060. In the first six days the figure (1070 to 1080) is higher than the specific gravity found between the sixth and tenth days of life—1060 to 1070.

2. The specific gravity of the first day of life (average, 1076) gradu-

¹ Jahrbuch f. Kinderheilkunde, 54, Band iv., Heft 1 und 2.

ally decreases up to the tenth day, when the average is 1065. The amount of this decrease from day to day was on an average of 0.001 daily, equalling 0.010 in the first ten days.

3. The specific gravity of the newborn is greater during the day than at night. This difference is greatest during the first three days of life (average, 0.003), and from then on gradually decreases.

4. The specific gravity of the newborn is influenced by :

(a) The degree of development of the child, being higher in a well-developed child than in a poorly developed one.

(b) The manner of tying the cord. When this is done late the specific gravity is higher than when done early. The sex and the circumstance of being the first child or not had no influence.

5. The specific gravity of the blood of infants with icterus is less than in those not affected. This difference appears only from the fourth day (when the icterus is usually seen) on, and amounts to about 0.003.

6. According to his investigations, there is no close connection between the specific gravity and the number of cells or between the specific gravity and the hæmoglobin content.

7. He holds it as possible that the composition of the blood can be influenced by the nationality.

Basophile Granules in the Erythrocytes. This subject has had considerable additions during the past year. Reference was made in last year's review of the subject to the earlier work and also to the more recent contributions of Grawitz, who has found the granular degeneration in cases of lead-poisoning. Some very interesting results have been reached by White and Pepper.¹ These authors have studied the question of degenerations of the red cells in lead-poisoning more extensively than any of their predecessors. Their work is divided into a study of the blood in (1) chronic lead-poisoning; (2) workmen in lead works presenting no subjective symptoms; (3) persons subjected to excessive local or general applications of heat and in heat cases; (4) in man and animals subjected to experimental intoxications.

In four cases of lead-poisoning with marked and typical symptoms granules were invariably present, the numbers ranging from a few to as many as nine degenerated erythrocytes in a single field of the microscope under a $\frac{1}{12}$ -inch immersion lens. Some of the granules were fine, others coarse. At times the fine or coarse were alone present; at other times a mixture of the two in the same cell. The number of granular cells bore a direct proportion to the severity of the disease,

¹ American Journal of the Medical Sciences, and Transactions of the Association of American Physicians, 1901.

and their disappearance usually marked the time of amelioration of symptoms. In the severe cases the coarse granules were generally in excess; otherwise the blood was practically normal, though the red cells were a little pale and irregular in shape and size. A few nucleated red cells were found, these being normoblasts and the majority showing granular protoplasm, while the nuclei were fully intact.

Of lead-workers showing no subjective symptoms there were 21 cases, in all of which granules were found. All kinds of workmen were examined; all being exposed to dust, though in varying amounts. In 2 instances the men had worked only 4 days, in 1 case the man had worked twenty-four years in the works, and in only 1 case had there ever been an attack of lead-poisoning. The number of degenerated erythrocytes varied up to two or three in a single field. The associated blood changes were as follows: 12 cases showed slight poikilocytosis, 2 had deficient hæmoglobin, 3 slight polychromatophilia, 5 showed normoblasts.

Neither in workmen subjected to heat nor in cases in which heat was applied locally as a remedial measure (300° F.), nor in cases in which lead-water and laudanum were applied to the unbroken skin, could granules be found.

EXPERIMENTAL STUDY. Dogs in which the blood was carefully studied for several days were given gramme doses of lead acetate in capsules with food. Distinct granules appeared usually in three days, not dependent on the proportion of the dose to the size of the dogs or on manner of increase of dose. Indistinct granules appeared after twenty-four hours. There was a tendency to clumping of the granules in dog's blood. The appearance of erythrocytes and polychromatophilia is too common in dogs used for experimental purposes to be considered as important. The clumping was usually absent in the "lead-workers," and the distribution of these granules was more even. Granules appeared in the blood of one of the authors twenty-five hours after taking $7\frac{1}{2}$ grains of lead acetate. The blood from the portal and splenic veins (in one dog killed for the purpose) showed more granules than blood from the heart or mesenteric vessels, or the blood taken from the ear ante-mortem. In five later cases this unequal distribution was not sufficiently marked to prove the peripheral origin.

BONE-MARROW. Spreads from this were made and showed granules when stained. These may have been in the circulating blood, and in no spread so obtained from bone-marrow was the number of granules greater than in circulating blood peripherally. The best fixing agents they found to be heat, absolute alcohol, absolute alcohol and ether, and a bichloride solution. From the bone-marrow fixed by various methods and mounted in paraffin, sections cut to 2 microns showed no granules.

Of the various methods of staining, they advise the usual hæmatoxylin and eosin or, what is especially good for the study of granules, thionin phenique. They employed heat usually for fixing the spreads. The specimens heated only a few minutes seem to stain best. Spreads from bone-marrow contain so much fat that fixing by heat does not give good results, and they advise one of the other methods above mentioned. Their conclusions are as follows :

1. The granules are a constant finding in cases of lead-poisoning, and appear very early in cases under the influence of lead salts long before subjective or other objective symptoms can be demonstrated.

2. The granules disappear in cases of chronic lead-poisoning as soon as convalescence is established.

3. Apparently lead does not produce an immunity, as one of the patients worked for twenty-four years and another for twenty years without having pronounced symptoms of lead-poisoning, and in both of these cases the granules were present in moderate numbers.

4. The granules may be produced experimentally in dogs, appearing in a few days after the beginning of the experiment, and increasing as the intoxication becomes severe.

5. The granules in the experimental cases are rather fine, and show a tendency to clump at first ; later all varieties appear.

6. We believe these granules to be a true degeneration of the erythrocyte and have no relation to nuclear fragmentation or to the polychromatophilia.

Jawein,¹ in the course of a report of a case of *bothriocephalus anæmia*, draws certain conclusions regarding the significance of basophile granules and polychromatophilic change in the red cells, regarding which we would thoroughly agree with Grawitz, that the author has attempted too much. It would have been better, as Grawitz claims, if Jawein made some experimental studies on the effect of lead before reaching positive conclusions regarding the nature of the granular erythrocytes. The case reported by Jawein was one of *bothriocephalus anæmia* of the progressive pernicious type. The blood on admission showed : red cells, 1,290,000 ; hæmoglobin (Gowers), 25 per cent. ; specific gravity, 1036. Drugs were administered at once, and the worm came away the following day, January 12th. Stained specimens of the blood at this time showed very many megalocytes, very slight poikilocytosis, and scarcely any microcytes. Red cells all stained well. Methylene blue-eosin stain was employed.

In spite of the removal of the worm the patient's condition grew worse, and on January 20th the temperature began to rise. The patient

¹ Berliner klin. Wochenschrift, 1901, No. 35.

grew weaker, and on February 5th a pneumonia was diagnosed. On February 10th the blood showed: red cells, 577,500; hæmoglobin (Gowers), 11 per cent.; white cells had risen from 5660 to 13,600. Microscopically the blood was as before, except for an increase in the proportional number of megalocytés.

February 11th was the crisis, and the patient became much better. On February 13th the blood showed: red cells, 1,444,000 (an increase of threefold in three days); hæmoglobin, from 11 per cent. to 26 per cent. in three days; specific gravity, from 1026 to 1029 in three days. A true "blood crisis."

Stained specimens showed the number of megalocytes proportionally diminished; the number of nucleated reds predominately normoblasts, though many megaloblasts were present; the nuclei of the new cells presented an eaten, unravelled, irregular contour; often several pieces of the nuclei were seen in the cell lying isolated from the nucleus; again, the nucleus looked like a network; 7 to 12 granules were seen arranged circularly, as though the nucleus had been blown to dust. The granules were more numerous, but finer, yet still retained the form of the nucleus; again, the granules were strewn irregularly throughout the cell, in all stages of transition from the finest to the coarsest granules. In the preparations of February 13th almost one-third of all the red cells were polychromatophile; and there were all shades of staining from pale violet to pure blue. The polychromatophilia was seen in normocytes and megalocytes, in many normoblasts and megaloblasts, and in many granular red cells. The further course of the convalescence showed less marked changes in the blood. The red cells did not increase so rapidly, and on February 24th there was an apparent standstill. With this cessation of the formation in the red cells the nucleated red cells and megalocytes gradually disappeared, and on the date mentioned the picture was almost normal.

Conclusions. Basophile granules and polychromatophilic degeneration occur only in young red cells, and are an evidence of regeneration. Since this was observed in adult blood no difference can be made between the polychromatosis in embryonal blood and that in adult blood. The basophile granules arise from karyorrhexis, both large and small granules.

The polychromatophilic red cells arise from a solution of a portion of the nuclear substance in the protoplasm of the red cell.

The appearance of red cells with either basophilic granules or with polychromatophilic degeneration is a sign of increased function of the bone-marrow.

The assumption of Grawitz—that various blood poisons can cause these punctate cells—is very improbable, as the author has not seen such occur.

The appearance of red cells with intact nuclei and basophile granules does not speak against the origin of these from karyolysis, as the author has seen a red cell with two nuclei—one normal and the other undergoing solution.

When these changes appear in the blood it shows that the bone-marrow has increased its functional activity, and the administration of arsenic and similar drugs is not indicated.

With Pepper and White I have come to the conclusion that basophile granulation is an evidence of degeneration, and we have therefore adopted the term granular degeneration, as suggested by Grawitz. We believe, as will be shown in a paper soon to appear, that the granules are in no sense the result of karyorrhexis, but are purely protoplasmic in origin, and that the evidence warrants the belief that the granules result from a degenerative change.

Hæmocytolysis. In connection with the above subject the article of Grawitz¹ on hæmocytolysis is of interest. He recognizes two distinct processes :

1. "PLASMOTROPE" ACTION, in which the circulating blood cells are not affected (that is, they are left intact), but through the action of the poison an increased number of red cells are destroyed in the liver, spleen, and bone-marrow, without a direct "lysis," with entrance of hæmoglobin in the plasma occurring.

2. "PLASMOLYSIS," in which there is a direct solution of the circulating red cells, with hæmoglobinæmia and its attendant phenomena. Certain substances, as "pyrocin" in small doses, exert "plasmotrope" action, while larger doses cause plasmolysis.

Of the pure plasmotrope poisons Grawitz gives lead as a type. In numerous examinations on cases of chronic lead-poisoning he has never found any evidence of hæmocytolysis, such as hæmoglobinæmia, icterus, or hæmoglobinuria, nor has he found a leucocytosis. He found in the blood of patients suffering from hemorrhage into the intestinal tract—particularly in cases of intestinal hemorrhage from gastric ulcer and cancer and from hepatic cirrhosis—granular degeneration of the red cells appearing in a marked manner. The granules soon disappeared. In one case of pulmonary hemorrhage where the blood was swallowed the granules also were found.

Von Colin² thought that hydræmia following loss of blood could lead to the degeneration of the red cells. His experiments were on rabbits, in which one-third of the total amount of blood was withdrawn; and Grawitz thinks this condition not comparable with a moderate

¹ Deutsch. med. Wochenschrift, No. 52.

² Münchener med. Wochenschrift, 1900, p. 186.

gastric hemorrhage. In some of his patients the hemorrhage was often so slight that Grawitz found no anæmic changes in the blood, yet the granules were present. Examinations on patients who had lost large amounts of blood from external injuries revealed no granules. These observations point to the fact that by the passage of blood through the digestive tract poisonous substances are found which are able to exert a plasmotrope action on the red cells. Experiments on a kitten, in which blood was introduced into the stomach by a tube, were negative in result. He tried the effect of the various hæmoglobin preparations on patients whose blood was normal and who had no severe organic disease. The preparations used were :

(1) Pfeiffer's hæmoglobin eiweisszeltchen ; (2) sanguin pill (Krewel) ; (3) hämol.

By the administration of 14 tablets of (1), 12 pills of (2), or 12 pills of (3), distinct granulation of the red cells appeared, which were increased by increasing the dose, and which disappeared when the medication stopped. It was found that anæmic persons, particularly females, reacted very promptly, the granules appearing after small doses. In healthy men large doses were necessary, and in several men the granules could not be obtained on any dose ; therefore by the passage of blood preparations through the digestive tract a poisonous product is produced, which exerts a plasmotrope action on the red cells. This is probably the result of the action of the bacteria of decomposition on the blood or blood preparation.

He reasons that the anæmia of anchylostomiasis is probably due to the two effects : (1) Loss of blood ; (2) absorption of the toxic product produced by the intestinal action on this blood. The worm itself probably does not produce a poison.

The Freezing-point of Blood. Determinations of the absolute freezing-point, as well as the alterations in this point under different circumstances, have been advised for the diagnosis of various conditions, especially disorders of the kidney. The following is of interest in this connection :

Géza Kövesi and Nikolaus Surányi¹ have attempted to show a relationship between the results of chemical analysis of the blood and its "concentration behavior," thus hoping to furnish a further aid to the diagnosis of functional diseases of the kidney.

With this end in view they determined, on the one side, the specific gravity and NaCl content of the blood ; on the other hand, the "lowering of the freezing-point," it being known that the specific gravity is chiefly dependent on the large molecules, while the lowering of the

¹ Oroosi Hetilap, 17, 1901.

freezing-point is influenced by the quantity of inorganic substances present.

In sixteen healthy persons they found a fairly constant relation between the above three factors, as follows :

$$(A) \quad \frac{\text{The lowering of the freezing-point}}{\text{specific gravity}} = 0.54-0.55.$$

This is a fairly constant worth.

$$(B) \quad \frac{\text{The lowering of the freezing-point}}{\text{NaCl}}, \text{ amounting to } 0.92-0.96.$$

This number also varied within comparatively narrow limits.

These "relational values" undergo a distinct displacement in kidney insufficiency, owing to the close relation between kidney activity and the composition of the blood. The results are grouped as follows :

The parallel increase of both "relational numbers" indicates a retention of NaCl and nitrogen; the moderate increase of "A" and the decrease of "B" point to a water, and particularly an NaCl retention; finally, a high worth of "A" in the presence of a normal worth for "B" indicates chiefly an impermeability of the kidneys to urea-containing molecules. In uræmic conditions both numbers undergo a distinct elevation.

Through the determination of the lowering of the freezing-point and the specific gravity we are in a position to determine the average molecular weight of the substances in solution in the blood.

If the relation of the two numbers shows that the molecular weight of these substances has distinctly decreased we are justified in assuming that a retention of the small molecules exists, and accordingly will the kidney insufficiency be demonstrable even in those cases where the water retention has concealed the damming back of the "harnfähigen" substances; thus the diagnosis becomes more certain.

The determination of "B" has the advantage that we are thus in the position to demonstrate whether the "chlorides" or "achlorides" are retained.

Differentiation of Human from Animal Blood. The properties of the blood plasma are still very obscure, though the increase in knowledge of the functions of this liquid during the last few years has been notable. A number of peculiar phenomena have been observed by physiologists and experimental pathologists, but the bearing of some of these phenomena on physiological processes or on pathological conditions is still largely conjectural. We have learned about bactericidal, bacteriolytic, lycogenic, antitoxic, and immunizing principles in the blood, though the source and nature of these various substances remain

obscure. The agglutinins are more recent additions to the group, and their study has thrown open a wide field of investigation and has placed at the disposal of the practical physician diagnostic methods of the widest application. Nothing can be clearer than that the blood is a fluid of very composite character, and that its functions are very much more complex than we have sometimes been disposed to think. The views of the earliest physiologists, based largely upon ordinary conceptions, ascribed to this fluid a complexity of composition and function which, in later times, has been denied to it. Increasing knowledge tends to swing the pendulum back to its early position.

A recent addition has been made to the peculiar reactions of the blood serum. This reaction seems to demonstrate a peculiar vital relation between the blood serum and certain soluble substances in the plasma. A precipitation occurs in the blood of one animal when treated with the serum of another animal inoculated during life with the blood of the first. The precipitation seems to be accomplished by some form of vital action on the part of "precipitins;" but the whole question is so uncertain that it would be hazardous to generalize.

Uhlenhuth² found that injections of blood serum from a cow into the peritoneal cavity of a rabbit caused a reaction between the blood serum of the rabbit and the blood of the cow of such character that the reaction was practically specific. His method of experimenting was as follows: On five successive occasions, at intervals of six to eight days, he injected about 10 c.c. of defibrinated beef blood into the peritoneal cavity of the rabbit. At the end of this time the serum of the rabbit was separated from the blood, and was tested with the blood of various animals. The blood, diluted 1 to 100 with water, was filtered, and a small quantity was further diluted with an equal quantity of double-strength normal salt solution (1.6 per cent.). The latter is important, because a watery solution would react with rabbit's serum to give a cloudiness, whereas serum does not give turbidity with normal salt solution. The author used 4 c.c. of the mixture of diluted blood and salt solution, and the blood experimented with was of beef, horse, ass, pig, sheep, dog, cat, deer, mouse, rat, as well as the blood of human beings. Six or eight drops of the serum of the rabbit previously injected with the heterogenic blood were added to the test-tube containing the diluted blood of these various animals. The solution remained unchanged excepting that containing blood of the animal which had been used for injection into the rabbit. In this there was first a cloudiness, becoming more intense, and finally a flocculent precipitation.

¹ Deutsch. med. Wochenschrift, 1901, No. 6.

In a second series of experiments rabbits were injected with human blood. The serum of these rabbits later gave the same reaction with human blood as was before obtained with cow's blood by the use of serum from a rabbit that had been injected with cow's blood. The author was able to obtain this reaction from blood dried for four weeks by dissolving the clot in sodium chloride solution. He was not able to decide whether the reaction would occur with the blood of nearly related animals; for instance, with human blood when the rabbit had been injected with monkey's blood, or the reverse. He believes that the reaction is dependent upon the development of a specific coagulation in the sense used by Ehrlich, and expresses the hope that the reaction will have great medico-legal value.

This remarkable behavior of the blood has been confirmed by a number of investigators. Nuttall and Dinkelspiel¹ found on injecting blood of various animals and man the same formation of specific precipitations described by Uhlenhuth. The serum from rabbits injected with human blood showed a slight action on the blood of two species of monkey. The slight reaction thus obtained could not be compared with the intense precipitation shown by the addition of the "anti-serum" to human blood. Blood exposed to sunlight for one week, or kept in a dark room at room temperature or at 37° for two months, still showed precipitation. Positive results were obtained from human blood putrified for two months when diluted 1 to 100 with normal salt solution. Diphtheria antitoxin preserved in tricresol for two years and seven months when injected in rabbits produced specific precipitation for horse serum. "Precipitin" was also produced by injection of pleuritic fluid preserved by chloroform for six months. Slight but distinct reaction was obtained from nasal and lacrymal secretion (human). Dilutions of human blood (1 to 100) mixed with an equal volume of dilutions of blood of the ox, sheep, dog, and horse, and tested for human blood, all gave positive reaction, and *vice versa*. Control experiments with normal rabbit serum, as also with non-homologous antiserums, gave negative results. They conclude that these "precipitins" are specific, although they may produce a slight reaction with the serum of allied animals. The substance in the serum which brings about the formation of the precipitins as also the precipitin itself are remarkably resistant. The new test can be applied to blood which has been mixed with that of another animal.

This reaction is not confined to blood alone, as has been just indicated and as was shown by a subsequent series of experiments of Uhlenhuth, who found that when rabbits had been injected with egg

¹ British Medical Journal, May 11, 1901.

albumin the serum contained a precipitin which would throw down egg albumin from solution. Even this reaction, however, was somewhat specific, for when chickens' albumin had been injected the blood of chicken was precipitated, as was also that of the goose, though much less strikingly. When albumin from goose eggs was injected a cloudiness was produced with the blood of geese and ducks, but less strikingly with dove's, hen's, and guinea-fowl's, and with the albumin of the eggs of the same species.

Wassermann and Schütze, working about the same time as Uhlenhuth, used the following method: They injected a rabbit five or six times with 8 to 10 c.c. of human blood. Six days after the last injection the animal was killed by bleeding, and the serum was separated. Human blood diluted with normal salt solution gave first a cloudiness, and later a precipitation. They found this only with human blood, though a faint cloudiness occurred with monkey's blood. Like Uhlenhuth, they found the reaction in old specimens of blood, such as spots upon cloth, wood, and the like. The blood in such cases was dissolved in physiological salt solution and then cleared by filtration.

Bordet and Tehistowitsch have also worked in the same line, and have extended the investigations by injecting rabbits subcutaneously with cow's milk. A serum is obtained in this way which, when mixed with cow's milk, causes a precipitation of the casein of the same; and subsequently Wassermann and Schütze showed that this reaction occurred only with cow's milk, and not with human and goat's milk. In a similar manner serum of animals treated with human milk reacted with this alone and not with other varieties.

It is very apparent from all of these observations that the serum is capable of developing various precipitins, and that this reaction is selective in its character. It is, perhaps, too early to discuss the value of this for diagnostic or medico-legal purposes, but the results thus far obtained are certainly very suggestive. From the practical side it is important to know how long after blood has been shed and allowed to dry as clots or stains the reaction might be obtained. Some investigations of Uhlenhuth¹ and others are of interest in this connection. The author just named found that the reaction could be obtained with blood: (1) Dried for three months; (2) blood decomposed for three months; (3) blood washed with weak alkaline soap; (4) blood frozen in snow for fourteen days at 10° C.; (5) blood solutions in which the hæmoglobin was changed to carbon oxide hæmoglobin. The decomposed blood was first filtered through a bacteria-proof filter. The author refers further to some investigations of Stern and Mertens, who found

¹ Deutsch. med. Wochenschrift, 1901, No. 17.

a specific reaction with urine containing albumin when blood serum of a rabbit that had been injected with human serum was used. Uhlenhuth found also that the serum of the rabbit maintains its action after heating for one hour at 60°C ., and also for three months after the addition of 0.5 per cent. carbolic-acid solution. He advises, however, that the fresh serum be used. The precipitate is dissolved by excess of ammonia and also in phosphoric acid. The nature of this reaction has not yet been fully explained, and much more confirmation is required before all of the facts recited can be considered established.

Schütze¹ has contributed some interesting observations bearing on this subject. The serum of normal guinea-pigs repeatedly injected with rabbit's blood, which is hæmolytic for the guinea-pig, loses its hæmolytic action. Bordet, Ehrlich, and Morgenroth assume as an explanation for the hæmolysis the presence of a specific active body—the so-called immune or intermediate body (*zwischen-körper*), which can endure a temperature as high as 60°C .—and a second more destructive substance, which they call the end-body (*end-körper*)—a sort of digestible ferment, destroyed at 60°C . In the guinea-pig injected with rabbit's blood the antihæmolysin appears to be present. To determine which of the two bodies before mentioned is concerned in the making of the antistubstance the end-product was removed by heating hæmolytic serum; then this serum, containing only the immune body, was injected beneath the skin of guinea-pigs, and their serum subsequently showed the presence of an antihæmolytic body. Quantitative experiments showed that the antitoxic substance produced was absent after injection of serum deprived of the end-product by heat, as in the serum of animals treated with unaltered blood. The treatment of animals with an emulsion of normal organs of other animals did not produce a serum destructive for cells of those organs. In connection with this statement it may be recalled that cytolytic sera have been separated by injection of emulsions of cells, such as ciliated epithelial cells, spermatozoa, etc. This subject, however, is rather outside the limits of the present discussion. For the greater practical usefulness of the blood tests referred to modifications must be made which will give greater accuracy and at the same time greater facility to the method. Recently Ziemke² has suggested a modification of the method advised by Uhlenhuth. In the case of old blood stains he uses potassium cyanide as a solvent instead of salt solution. The suspected blood is extracted with a concentrated solution of potassium cyanide. The mixture is shaken with a few granules of tartaric acid until it becomes almost neutral with litmus paper, and then filtered. As long as it remains alkaline it is clear,

¹ Deutsch. med. Wochenschrift, 1901, No. 26.

² Ibid., No. 42.

but the least trace of excess of acid causes cloudiness. The mixture is diluted to a yellowish-red color and the serum from a rabbit added.

In regard to the methods of preserving the specific serum the author has tried chloroform with fairly good results. In the course of time, however, there was a diminution in the intensity of its action. Nolf has shown that the active principle of the serum is connected with the serum globulin. By saturation of the serum with magnesium sulphate, or by the addition of an equal quantity of a saturated solution of ammonium sulphate with after-washing in "half saturated" ammonium sulphate solution, the serum globulin is precipitated, collected on an "ash-free" filter paper, and so isolated from the serum albumin. The serum globulin so collected is kept over sulphuric acid, and when dissolved in physiological salt solution, even after considerable time, will give the Uhlenhuth reaction.

The author has obtained the specific reaction with this "dry serum" three months after its preparation, but the intensity was not so great as the reaction given by the fresh serum.

He thinks that at the present time there is no reliable means of preserving the specific serum.

For dissolving the dried blood, besides the physiological salt solution the author has used a 0.1 per cent. solution of soda, which he thinks possesses more extracting power.

In deciding as to the presence of the reaction or not Ziemke lays most stress on the formation of the flocculent precipitate, which he thinks is characteristic.

Agglutination of Blood-corpuscles. In connection with the precipitation by heterogeneous blood serum it is of interest to refer briefly to some experiments that have been made in the direction of the development of agglutinating principles which cause increased viscosity and coherence of blood-corpuscles. The attempt has been made to show a specific relation of the serum of different diseases to such an agglutinating action, but thus far the matter is still very unsettled. Camus and Pagniez¹ found that in pathological states human serum may agglutinate the red corpuscles of other human beings. Normal sera do not cause agglutination so far as their studies have gone. Among the pathological sera a large number have this agglutinating power, but do not manifest it on the corpuscles taken from another man suffering from the same disease, only on normal blood. The active sera came chiefly from anæmic and cachectic patients, the majority having had tuberculosis. The red cells from a patient whose serum has marked agglutinating power may be completely refractory to agglutination by other

¹ Gaz. Hebdomadaire de Médecine et de Chirurgie, March 7, 1901.

serums. As in the case of animal sera the property is lost to a great extent by heating to 58° or 60° C., though it is not entirely destroyed. Another investigation bearing specifically upon a certain type of disease is that of Grixoni,¹ who claims that when two drops of malarial blood flow together beneath a cover-glass that the red cells approach each other, group themselves together, and form small clumps. This occurs within about a minute. The cells may retain their normal appearance or may change, liquefy, and lose their hæmoglobin. The groups may consist of 5 to 10 to 100 red cells. No red cells remain separate. The white cells are not affected. Rouleaux formation does not occur. This peculiar agglutination is exerted by malarial blood on normal blood, and also on the blood from infectious and other diseases. So long as the phenomena remain the malaria cannot be considered as cured. Quinine, both "in vitro" and in the diseased organism, checks the agglutination. No other disease except typhoid fever gives the same phenomena. This phenomena can be seen easily by weak powers of the microscope within a minute, and macroscopically within ten minutes. According to Grixoni, the first to call attention to the above were Lo Monaco and Panichi.

Pernicious Anæmia. While very little that is new has been added to our knowledge of this disease, a rather large number of cases have been reported during the last year. Many of these have probably been the subject of previous papers, yet the manner in which these cases are analyzed offers much that is of value from a clinical and statistical point of view.

Strauss and Rohnstein² report the blood findings in 23 cases, with especial reference to the behavior of the leucocytes; Billings³ gives the clinical history of 9 new cases, and reports concerning the course of the cases he discussed the year previous; McPhaedran⁴ gives his observations, chiefly as to symptoms and treatment, based on 22 cases seen within the last three years; McCrae⁵ presents statistics of 40 cases, including blood conditions as well as physical examinations; and Hunter, of London, has written a book on the subject (which has not reached this country as yet), in which he defends his theory as to the origin of the disease.

ETIOLOGY. Most investigators agree as to the toxic nature of pernicious anæmia, but as to the origin, characteristics, and mode of action of the toxin concerned there is a diversity of opinion. McPhaedran⁶

¹ *Gaz. degli Ospedali*, 1901, No. 57.

² *Die Blutzusammensetzung bei den Verschiedenen Anämien*, Berlin, 1901.

³ *Journal of the American Medical Association*, August 24 and 31, 1901.

⁴ *Lancet*, January 18, 1902.

⁵ *Journal of the American Medical Association*, January 18, 1902.

⁶ *Loc. cit.*

believes that the symptoms of the disease can only be explained by the presence of a toxin. This acts on the blood-making organs affecting hæmogenesis, thus producing abnormal cells, while there is also a hæmolysis, resulting in the destruction of the less resistant erythrocytes. Among the conditions that point to this toxic theory are the changes produced in the spinal cord and the peripheral nerves, which are probably not the result of the protracted anæmia; the fact that the general condition does not bear a definite relation to the state of the blood (he quotes one case in which the patient, with only 1,000,000 red corpuscles per cubic millimetre, was able to carry on his business as a miller, doing the heavy work attendant on this occupation, while another patient, with 4,000,000 erythrocytes, had too little strength to perform even the lightest labor); the early occurrence of marked weakness, which in most cases is the first symptom complained of, and the great frequency of gastro-intestinal disturbances.

Hunter¹ repeats his well-known view that the alimentary tract is the site of the pathological process, and states that the lesions here found bear the same relation to pernicious anæmia as the throat lesions bear to diphtheria or the intestinal lesions bear to typhoid fever. He lays special stress on the frequency with which dental necrosis, suppuration of the gums, sore-tongue, gastric pain, etc., occur in this disease. Against this theory McPhaedran very properly offers the objection that if diseased conditions of the gums and teeth were causal in producing pernicious anæmia the disease would be much more frequent than is now the case.

SYMPTOMATOLOGY. In considering the symptomatology the cases of McCrae and McPhaedran are combined, to avoid repetition. Of the 62 cases reported by these two authors 48 were males and 14 females. Four-fifths of McCrae's cases were over thirty years of age, the youngest being ten, the oldest sixty-six. While the admissions to the Johns Hopkins Hospital, the source of McCrae's cases, are in the ratio of 1 colored patient to 7 white ones, only 2 cases of his 40 were found in negroes. In none of McPhaedran's 22 cases was an apparent cause to be found, although 2 of them gave a history of the disease occurring in the family. The mouth condition was noted in 17 cases, and of these 10 had one or more carious teeth, but they were too well cared for to be considered as causal. In 4 cases only were the gums affected, 3 but slightly, and the fourth rather severely. These cases were not more affected with gastritis or stomatitis than those in whom the mouth lesions were absent. McCrae examined the mouth in 10 cases, and found carious teeth or other septic processes in 4 out of this number;

¹ *Lancet*, March 30, 1901.

14 of his cases gave a history of previous malaria, 7 had a tuberculous family history, 4 had a syphilitic history, 3 only gave a history of mental distress and worry, and in but 1 instance could a previous confinement be connected with the disease. The onset in all of McPhaedran's cases was with weakness, followed very soon by pallor, though the latter may at times be delayed, showing that the weakness is independent of the anæmia. Of McCrae's cases the first symptom noted was weakness in 14; weakness associated with other conditions in 9; dyspnea in 9; digestive disturbances in 8. In the order of their frequency the symptoms mentioned by McCrae's cases in giving their histories were: Weakness in 26; change of color in 25; loss of weight in 22; shortness of breath in 16. Digestive disturbances with diarrhoea were present in 11 cases; gastric symptoms alone in 8. Hemorrhages from the mucous membranes occurred in 9 cases, while there had been some œdema in 8.

In looking over this tabulation of the symptoms mentioned by the patients the frequency with which the patients complain of loss in weight is striking, as the absence of emaciation in this condition is usually considered a characteristic feature—a point to which McCrae calls attention.

PHYSICAL EXAMINATION. Taking up the physical examination of the patient, McCrae found marked emaciation in 10 cases; typical lemon-yellow color of the skin in 29; while in 7 there was marked pallor without any special yellow tint, pigmentation was present in 8, and in 4 petechia were found.

Among the circulatory changes, visible pulsation of the vessels was noted in 16; a systolic apex murmur was heard in 15; a systolic murmur could be heard over the entire heart in 13; in 1 case there was a systolic murmur that could be heard only in the pulmonic area; in 12 cases a systolic bruit was detected over the cervical vessels.

Examination of the abdomen revealed a palpable liver in 2 cases, and while the spleen could be felt in 6, the enlargement of the latter was in no instance marked. General enlargement of the glands was present in 3 cases, and in 5 other cases the majority of the glands were increased in size. In only 10 of the 40 cases was the temperature normal, and in 30 cases it was more or less elevated. The urine showed a slight trace of albumin in 17 cases, but in none was sugar found.

DIGESTION. The importance which Hunter attaches to the digestive tract as the source of the infection in pernicious anæmia has already been noted. McPhaedran, however, is of the opinion that there is not sufficient evidence to consider the toxin of the disease as of intestinal origin, in spite of the fact that in all of his cases at some time or other there was vomiting and diarrhoea. As a rule, he finds that the weak-

ness precedes any gastric or intestinal disorder, while the gastric atrophy found at autopsy occurs as well in carcinoma of the stomach, and, besides this, there is no proof that the atrophy of pernicious anaemia is not a late change. The absence of free HCl cannot be looked upon as proof, for such an absence of free HCl has been noted in many conditions and the ability of a patient during a period of remission to digest an average diet gives every evidence that, at such times at least, the secretion of HCl is going on, which would not be the case were a gastric atrophy present. Of McCrae's cases during observation 22 showed no gastric symptoms at all, while 18 showed slight and 4 grave disturbances. The bowels were normal in 16, constipated in 14, diarrhoea in 8, and alternating constipation and diarrhoea in 2 cases.

NERVOUS SYSTEM. In a considerable percentage of the cases reported in the last year nervous manifestations of greater or less severity have been present, McCrae finding 27 per cent. of his cases so affected, while McPhaedran reports over 40 per cent. The prevailing type found by McCrae was one with some sensory disturbances, especially in the extremities, associated with a more or less marked spastic condition. Brown, Langdon, and Wolfstein¹ report an interesting case in this connection of combined sclerosis of Lichtheim-Putnam-Dana type. Their patient was a male, aged thirty-four years, who, in July, 1898, first noticed a weakness in his legs associated with stiffness and rigidity. This condition increased in severity, associated with a loss in weight, up to the time of his admission to the hospital, in January, 1900. At this time his blood count showed: red cells, 1,661,000; leucocytes, 3000; haemoglobin, 54 per cent., giving the very high color-index of 1.54; poikilocytes were not numerous; megaloblasts were present.

On examination it was found that all the joints were movable, though the legs were rigid; and on account of this stiffness, combined with weakness, he was unable to walk. Some inco-ordination was present in both upper and lower extremities. Sensation for pain and touch was diminished about the ankles; the knee-jerks were increased; ankle clonus and the Babinsky phenomenon were present on both sides. The patient steadily grew weaker, and died April 11, 1900. At the autopsy no marked macroscopical changes could be detected in brain or cord, but on microscopical examination a degeneration of the posterior and lateral tracts was discovered. The posterior degeneration commenced as low in the cord as the lower lumbar level, and could be traced to the level of the pyramidal decussation. The tracts of Goll and Burdach were only in part involved. The oval field of Flechsig was free, as was the ventral field of Goll's tract. The column of

¹ Journal of the American Medical Association, March 2, 1901.

Burdach was involved only in parts, and between the column and the posterior border of the gray cord there was, in all levels, healthy nerve tissue. The pyramidal tracts showed degeneration from a point in the medulla as high up as the olivary bodies to as low down in the cord as the sacral region. The ending of this degeneration was at a lower level than the commencement of the ascending degeneration. In the dorsal and cervical levels the entering posterior nerve-root bundles appeared to be slightly involved. The vascular changes were not marked. In certain places the walls of the smaller vessels showed hyaline changes, but there was no evidence of inflammation. There were no areas of round-cell infiltration or of anything that might be taken for small, multiple, hemorrhagic foci. In both the posterior and the pyramidal tracts there was marked glia increase.

The authors offer no theories in explanation of the findings made, and very properly do not attempt to draw conclusions from one case. They believe, however, that the findings in this case are at variance with the view of Nonne, that the degeneration is due to ascending and descending degenerations following on multiple areas of softening of inflammatory, hemorrhagic character, in which several areas become confluent and give the appearance of systemic lesion. The findings in this case seem to the authors to be more in accord with the view advanced by Burr and others, who consider the lesion as a primary systemic degeneration—primary as far as the cord is concerned, and distinctly neuronic, but secondary etiologically to some condition superinduced by the pernicious anæmia.

Batten¹ reports a case of subacute combined degeneration of the cord in pernicious anæmia. The patient first became ill in 1894, but it was not until 1897 that the diagnosis of pernicious anæmia was made. At this time he showed no nervous symptoms, and improved under treatment. In 1899 he was admitted to the hospital suffering with spastic paraplegia, which had developed about two months before. He improved somewhat, and was discharged in February, 1900, only to be readmitted in April of the same year. He now showed all the signs of advanced pernicious anæmia. The legs were rigid, but slight voluntary power remaining. The knee-jerks were increased, and ankle clonus was present. Below the knees there was anæsthesia. Toward the close control of the sphincters was lost, and a bed sore developed over the sacrum.

The autopsy showed, on microscopical examination, degeneration of the posterior columns, degeneration in the region of the crossed pyramidal and direct cerebellar tracts, and also in the region of the direct pyramidal tracts.

¹ *Lancet*, January 19, 1901.

THE BLOOD. While the statistics of a considerable number of cases give rather constant averages as to the number of red cells, the variations which are apt to occur during the periods of improvement should be borne in mind. In 23 cases examined by Strauss and Rohnstein the average number of erythrocytes was 1,240,000, which is practically the same as was found by McCrae; yet the former authors had 2 cases in which the enumeration reached over 4,000,000, while in 3 instances they found less than 500,000 red cells.

Nucleated Red Cells. In counting 1000 leucocytes McCrae found an average of 37 erythroblasts, of which 23.4 were normoblasts, 4.7 megaloblasts, and 9.4 intermediate forms. The largest number of nucleated red cells were found in 3 cases that improved under treatment. Leaving out these 3, McCrae finds that the average number of nucleated red cells in 11 cases that terminated fatally was 23 to 1000 leucocytes, of which 7.6 were normoblasts, 11 were megaloblasts, and 4 belonged to the intermediate forms. Of the improved cases (16) the erythroblasts averaged only 7 to the 1000 leucocytes, 5 being normoblasts, 1 megaloblast, and 1 intermediate.

The findings in McCrae's fatal cases are in accord with the views expressed by Cabot, Ewing,¹ and others, who believe that in pernicious anæmia there is always an excess of megaloblasts over the normoblasts. Strauss and Rohnstein, however, found that megaloblasts were absent in three of their cases, in which the diagnosis was confirmed by autopsy, in spite of repeated examinations. I have myself seen and recorded an instance of the same sort, and have observed one or two others. Billings mentions 2 cases in which no nucleated cells have been found for a period of over a year, although frequent examinations have been made.

In all cases of this disease there are found changes in the shape and size of the erythrocytes. To this variation from the normal size Strauss and Rohnstein have given the name of "anisocytosis," and they call attention to the fact that this condition is of frequent occurrence in all anæmias.

As a means of determining the size of the red cells Billings suggests the use of the hæmatocrit instead of the actual measuring of the individual cells. The percentage volume of the red cells as a whole, as obtained from the graduated tube of the hematocrit, is divided by the percentage number of red corpuseles obtained by counting in the usual manner, which gives the percentage volume of the individual cell. For this quotient the name "volume index" is suggested.

Thus a reading of 45 on the tube equals 90 per cent. by the hæmatocrit, and if in a given case the red cells number by the Thoma-Zeiss

¹ Clinical Pathology of the Blood, 1901.

count 3,750,000, or 75 per cent., then $\frac{2.0}{1.5}$ or 1.20 equals the volume index. Out of 12 cases on whom this test was applied all have shown a large volume index throughout the greater part of their course. The lowest was 0.93 and the highest 1.93. In some instances the volume index was increased when the size of the cell was not above the normal, thus indicating an enlargement of the cell in depth, but not in circumference.

Strauss and Rohnstein found macrocytes present in all their cases, generally in large numbers, which, according to Ewing,¹ is a diagnostic point in pernicious anæmia. He considers an anæmia pernicious when 33 per cent. of the red cells are macrocytes containing an increased amount of hæmoglobin or when the megaloblasts outnumber the normoblasts.

Hæmoglobin. The occurrence of a high color-index in pernicious anæmia, which is generally looked upon as one of the characteristics of the blood in this disease, is apparently not constant. Strauss and Rohnstein found the average color-index in their 23 cases to be 1.08, but it varied from 0.50 in the lowest to 1.95 in the highest. This is rather higher than was found by McCrae. In his 36 cases the hæmoglobin averaged 30 per cent. (Fleischl), while the red cells averaged 1,560,000, giving a color-index of about 1, unless we consider that the normal hæmoglobin percentage in this country is less than 100 per cent., as estimated on the Fleischl instrument.

Leucocytes. In the work by Strauss and Rohnstein much emphasis has been laid on the behavior of the leucocytes in pernicious anæmia, and they incline to the opinion that from the differential count of the white cells the diagnosis of this disease from other varieties of severe anæmia will be more easily accomplished. Accepting the normal number of leucocytes to be 6000 per cubic millimetre, they found in all but two of their cases a diminution in this number, the average being 5000. As to the individual forms of white cells, their results, if proven to be constant, are of value. In all their cases they found a diminution in the percentage proportion of the multinuclear cells, the average number being 52.5 per cent. At the same time they found an increase in the percentage proportion of the mononuclear cells, the average here being 45.1 per cent. in the 23 cases, of which 37 per cent. were lymphocytes. In all the cases excepting one, in which the patient was moribund at the time of examination, the percentage of the multinuclear cells was below 70 per cent., while in all the percentage of mononuclear cells was above 30 per cent. In 13 cases, or more than half, the mononuclear cells averaged more than 50 per cent. They consider that this behavior on

¹ Loc. cit., p. 191.

the part of the leucocytes¹ is of special value in making the very difficult diagnosis between pernicious anæmia and some forms of gastric carcinoma, for in this latter condition they have found generally a slight tendency to a leucocytosis, together with an increase in the percentage of the multinuclear cells and a decrease in the percentage proportion of the mononuclear leucocytes.

These results of Strauss and Rohnstein are somewhat different from the ones obtained by McCrae. The latter found in 36 cases an average leucocytic count of 6929, while the differential counts from 30 cases showed the multinuclear cells to average 64 per cent., and the mononuclear cells gave a percentage of 34. As to the lymphocytes, McCrae comments on the fact that in 11 fatal cases there was only an average of 29 per cent., while in 19 cases that improved under treatment the percentage averaged 31.

It is but fair to mention that Strauss and Rohnstein insist on special precautions in making differential counts, claiming that the two cover-glasses used in preparing the smear should always be counted, as they have found a difference of 3 to 6 per cent. in the number of lymphocytes on the two cover-glasses, the larger number being on the upper glass.

DIAGNOSIS. The difficulties attendant on this are many, and often it will be impossible. From the two cases of Strauss and Rohnstein, in which the red corpuscles numbered over 4,000,000, and the three instances in which no megaloblasts could be found, it is evident that the diagnosis cannot be made from a blood examination alone. Hunter² insists that the diagnosis must rest on four groups of symptoms: (1) Weakness and extreme anæmia, with their usual effect; (2) hæmolytic symptoms, as evidenced by urobilinuria and the lemon-yellow color of the skin; (3) oral and gastro-intestinal symptoms, such as sore tongue, dental necrosis, suppuration of the gums, gastric pain, etc.; (4) toxic symptoms, such as tingling and numbness of the fingers and irregular pyrexia. Generally speaking, the diagnosis can only be arrived at by carefully excluding the various causes which are known to produce severe anæmia, special attention being given to the examination of the gastro-intestinal tract, where the presence of parasites or the occurrence of small, repeated hemorrhages may produce an anæmia of the gravest type.

Probably the greatest difficulty is experienced in differentiating those cases of gastric carcinoma where the dominant feature is a profound anæmia, with almost no indication of stomach involvement.

¹ Strauss and Rohnstein quote similar findings as to the lymphocytes in cases reported by Pepper and Stengel, Krebs, Hayem, and others.

² Loc. cit.

The behavior of the leucocytes in these conditions has already been pointed out. It may be permitted to mention in this connection that Boas¹ has been able to demonstrate the presence of blood in the gastric contents by the guaiac-turpentine test in all of the 20 cases of gastric carcinoma that he has recently examined. This was possible, even when no blood was visible to the eye, and, while it may occur in other conditions, it does so intermittently.

TREATMENT. Rumpf,² in connection with Dennstedt, has investigated the chemical composition of the blood and the organs in pernicious anemia, and has found that along with the increase of water in the former there was a marked increase in the chlorine, while the potassium content was diminished. The amount of chlorine was increased in heart, liver, brain, and spleen as well as in the blood; only in the liver was the amount of potassium above the normal. Whether this diminution of potassium is a primary manifestation due to direct action of a toxin on the potash leading to its breaking down and removal from the body, or secondary to the death of the potassium-containing blood cells, there is a possibility that this lack of potassium may interfere with the regenerative attempts of the blood-building organs, and thus lead to the usually fatal determination of the disease. Rumpf accordingly advises the administration of the easily assimilable potash salts—the tartrate or citrate—which may be given in infusion or otherwise combined. He reports 4 cases where the results were very satisfactory, while in 4 others no improvement was noted.

Hunter advises careful attention to the teeth, administration of intestinal antiseptics, and the injection of antistreptococcic serum. The latter should be given in doses of 5 c.c. at a time when the temperature is comparatively steady.

McPhaedran has tried a great variety of measures in his cases. Contrary to most observers, he has obtained no benefit from the administration of arsenic. Intestinal antiseptics were also without effect. In two cases antidiphtheritic serum gave good results, but in a third there was no effect. Normal saline solution produced a favorable effect, but when given hypodermically it was so painful that the patients refused to continue it, while by the rectum it produced diarrhœa.

Spermin (Poehl) was given to one patient, with apparent good results for the time being; 10 c.c. were administered in divided doses, extending over a period of ten days.

McPhaedran found plain horse serum, as well as antistreptococcic serum, valueless. He calls attention to the fact that the disease is markedly remittent, and thinks that most of the cures reported are instances

¹ Deutsch. med. Wochenschrift, 1901, No. 20.

² Ibid., No. 31.

of remission. He says of treatment: "No plan of management or treatment so far devised avails to cure the disease or even, in most cases at least, to alter its erratic course."

McCrae advises, as treatment, absolute rest in bed, fresh air, good food, arsenic, and attention to the mouth.

Leukæmia. CLASSIFICATION. The study of this disease is rendered difficult by the great variety of names used in describing the different types. In this discussion of leukæmia Walz¹ gives the following as the ordinary classification: (1) The ordinary form, in which the chief clinical feature is the enlargement of the spleen, variously known as "splenomedullary," "myelogenous," or even "lienal." (2) Acute leukæmia. (3) Chronic lymphatic leukæmia or lymphæmia, which stands in close relation to pseudoleukæmia. Although in general use, this classification is, according to Walz, open to objection. To look upon "acute leukæmia" as synonymous with acute lymphatic leukæmia is not justified, since chronic forms of the lymphatic type have been described. Besides, it is not certain that cases of acute myelogenous leukæmia do not occur. Walz, however, does not believe that a case of this kind has been reported as yet that is not open to objection.

PATHOGENESIS. Concerning the pathogenesis of leukæmia, much has been written, but as yet no single theory has been advanced which meets with general approval. The theory first advocated by Fraenkel—that the lymphocytes represent the young form of the white cells, and that acute lymphatic leukæmia may be looked upon as a condition where the white cells are swept into the blood without having had time to ripen, while in the chronic myelogenous variety the ripening process has been completed—is denied, as this explanation does not account for the undoubted cases of chronic lymphatic leukæmia that have been reported. Ehrlich and Lazarus² emphasize the differences between the two forms of the disease corresponding to the sharp distinction they make between "myeloid" and "lymphatic" tissue on the one side, and polynuclear cells and lymphocytes on the other. Since the former are active motile cells, they assume that in myelogenous leukæmia the growth of the myeloid tissue produces a stimulation resulting in the active emigration of these cells—active leucocytosis. The non-motile lymphocytes, on the contrary, are, with the growth of the lymphatic tissue, passively swept or washed out into the blood-current—passive leucocytosis. As will be seen by the discussion below, this theory is also objected to.

While it is generally believed that the blood-making organs are at

¹ Centralblatt f. Path. u. allgemeine Path. u. patholog. Anat., 1901, No. 23.

² Spec. Pathol. und Ther. von Nothnagel, 1901, Band viii., Th. I., Heft 3.

fault in leukæmia, this opinion is not unanimous. Löwit has long advocated the parasitic theory of the disease, and considers that the primary involvement is of the blood, and that the organs are secondarily affected. Likewise, speaking against the primary implication of the blood-building organs, are the cases in which no anatomical changes were found. Pinkus¹ explains the case published by Hirschlaff,² on the ground that the cells were so rapidly swept into the circulation that a collection of lymphatic tissue was nowhere possible, not even in the bone-marrow. More recently Dennig³ has described a similar case. The patient was a girl, aged nineteen years, and the disease ran its course in about ten weeks' time. The blood count, taken two weeks after admission, showed 800,000 red cells, 20,000 white cells, and 20 per cent. hæmoglobin (Fleischl). The stained specimen showed the greater number of the white cells to be large mononuclears, with a faintly staining, concentrically placed nucleus surrounded by a narrow zone of protoplasm not containing granules. Small lymphocytes (size of a red cell) were also present. The polynuclear leucocytes were few in number, and no "mastzellen" were found. A stained specimen obtained an hour before death showed the small lymphocytes to be greatly in excess, the polynuclear cells in a lesser quantity, while only occasionally were large mononuclear cells found. At the autopsy both the femora and the long bones in general showed no change. No swollen lymph glands were found. The spleen weighed 180 grammes, and measured 14 x 7½ x 3 centimetres. The liver weighed 1700 grammes. Microscopical examination of the spleen and lymph glands was negative. The liver showed areas of small-cell (lymph-cell) infiltration scattered through the capsule of Glisson. The juice from the sternum and ribs showed nucleated red cells, numerous lymph cells, absence of the large forms, and many small fat-drops. The lymph cells were more numerous than the red cells. A number of small hemorrhages were found throughout the internal organs.

Walz believes that these negative findings are due to insufficient examination. Thus in the case of Dennig, by a later and evidently more careful examination, Walz was able to demonstrate very decided changes which he will report some time in the near future. In connection with the cases of reported leukæmia without lesions in the solid organs it may be remarked that the diagnosis is far from certain in some, and the histological examination inadequate in others.

Among those who look upon leukæmia as a disease of the blood-making organs there exists a difference of opinion as to the character

¹ Spec. Pathol. und Ther. von Nothnagel, 1901, Band viii., Th. I., Heft 3.

² Deutsch. Archiv. f. klin. Med., 1899, Band lxi.

³ Münchener med. Wochenschrift, 1901, No. 4.

of this disease. Ehrlich and his followers believe that only the lymphatic glands and the bone-marrow are concerned in the leukæmic process, the spleen being held as a doubtful source of leucocytes, producing at the most only a few cells and these of the non-granular variety. Considering then, as he does, that the polynuclear cells arise only in the bone-marrow, and the lymphocytes only in the lymphatic glands, the assumption that myelogenous leukæmia is a disease of the bone-marrow, while in lymphatic leukæmia the lymph tissues (glands) are at fault, seems very reasonable, and theoretically separates the two conditions sharply. The excess of lymphocytes that occurs in the bone-marrow in lymphatic leukæmia is explained by supposing that they replace the normal cells. Walz does not agree with this view. He believes the bone-marrow to be a modified form of lymphatic tissue that normally produces chiefly granular cells and the earlier forms of these, but which is capable of producing lymphocytes as well. Basing his opinion on a case of lymphatic leukæmia seen by him in which no swelling of the lymph glands occurred, he thinks we are not justified in looking on lymphatic leukæmia as a disease of the lymphatic apparatus alone. "If in myelogenous leukæmia the spleen and the lymph glands can become myeloid, these organs must participate in the formation of the white cells of the disease. On the other hand, if the bone-marrow belongs to the lymphatic apparatus, and is normally able to form lymphocytes, it must be concerned causally in lymphatic leukæmia, as well as the spleen, lymph glands, and various lymph nodes throughout the body."

Pappenheim¹ describes a case similar to that of Walz under the heading of "*Lymphæmia ohne Lymphdruesenschwellung*," and comes to the conclusion that when only the spleen and the lymph glands are involved pseudoleukæmia results, while with implication of the bone-marrow true leukæmia is produced.

THE ETIOLOGY OF LEUKÆMIA is still an unsolved problem. Various predisposing causes have been described, such as influenza, typhoid fever, malaria, poor nutrition, etc. The connection between these causes and the condition can scarcely be a close one or the disease would be more frequent than is now the case. A tendency of pseudoleukæmia to change into true leukæmia has been observed.

Wende² reports a case of this character. The patient when first seen was a typical example of Hodgkin's disease, with marked glandular involvement. The blood count at that time, April 26, 1900, showed red cells, 5,128,000; white cells, 4000; hæmoglobin, 88 per cent.

¹ Zeitschrift f. klin. Med., 1900, Band xxxix.

² American Journal of the Medical Sciences, December, 1901.

The polymorphonuclear leucocytes numbered 68 per cent. and the small lymphocytes 27 per cent. For a time the patient did well on arsenic, but this soon lost its effect, and there was a change for the worse. The blood picture on July 10 was : red cells, 1,936,000 ; white cells, 34,000 ; of which 95.5 per cent. were small lymphocytes and 3.4 per cent. of the polymorphonuclear variety. Hemorrhagic eruptions occurred, the temperature rose, and death took place on July 30. The blood count taken ten hours before death showed a diminution in the total number of leucocytes, but the high percentage of the small lymphocytes was still present.

Concerning myelogenous leukæmia nothing that is new can be mentioned. In practically all particulars the picture both clinically and pathologically is a complete one. Cases of acute lymphatic leukæmia are reported from time to time without adding anything new to our knowledge of the disease. According to Mixa¹ the total number of cases up to and including his own is 69.

LYMPHATIC LEUKÆMIA. According to Walz chronic lymphatic leukemia is an extremely rare condition, and in a bibliography that includes 223 references he finds only 10 cases reported, and some of these he considers as open to doubt. Walz thinks that only cases of over sixteen weeks' duration should be looked upon as chronic, and comments on the difficulty of making a diagnosis between the acute and chronic forms, the blood picture being the same in both. Of interest in this connection is the case reported by Scott.² The patient was nine months old when first seen, May 20, 1900. The parents, Italians, were apparently healthy, as were two other children. A third child, who is still in Italy, is said to have had an enlarged spleen and to have been anæmic since birth. She is still alive at the age of twelve. The patient seemed to be normal at birth, and was apparently healthy until he was a month old, when the parents noticed his marked pallor. Since then he has had recurring attacks of intestinal catarrh, with green stools. When seen on May 20th the spleen was four inches below the costal margin. No enlargement of the liver or of the lymphatic glands was noted, and there was no evidence of rhachitis. The blood was not counted at this time, but from the spreads examined it was seen that a leukocytosis existed, with a large percentage of lymphocytes. Microcytes, macrocytes, and poikilocytes were observed, also normoblasts. During the summer the child had attacks of diarrhœa, and the spleen increased in size. An examination of the eye-grounds made in November, 1900, revealed a neuroretinitis, with pallor of the engorged

¹ Wiener klin. Rundschau, 1901, 38 and 39.

² American Journal of the Medical Sciences, January, 1902.

vessels, but no hemorrhages. In January, 1901, a small amount of blood was coughed up; but this was the only hemorrhage. The liver became palpable in May, 1901, just before death. During this period the number of the red cells remained practically unchanged. The leucocytes varied between 105,000, the highest count, and 18,800, the lowest count. The differential counts made over a period of a year showed in every instance a high percentage of lymphocytes. At no time was the percentage of the mononuclear cells below 44 per cent., and in the count made shortly before death 99 per cent. were found. In all spreads except the first myelocytes were seen, but not in large numbers. Various forms of nucleated red cells were met with, and some of the erythrocytes showed polychromatophilia. The blood picture corresponds to the description given of von Jaksch's disease, but Scott was unable to find reports of differential counts made in cases of the kind. Most of the diagnoses seem to have been made on the clinical symptoms and the presence of a leucocytosis. The author thinks that the duration, course, blood picture, and termination of his case are comparable to these features in the leukæmias of the adult.

Closely resembling the case of Scott are the two reported by Jewett.¹ The first case was in an infant of thirteen months, whose illness began in March, 1900, and was characterized by severe anæmia, feebleness, occasional diarrhœa, and malnutrition. A slight, irregular fever began in April. In May the left-sided tumor was first noted. There was at no time any hemorrhage or enlargement of the superficial lymph glands. When seen by the author, on June 1, 1900, the spleen reached to the umbilicus. The blood count showed 1,912,000 red cells; 21,000 white cells; 30 per cent. hæmoglobin. (Fleischl.) In the differential count it was impossible to separate the lymphocytes into classes, as there were so many gradations. The lymphocytes (large and small) amounted to 87 per cent.; polymorphonuclear neutrophiles, 10 per cent.; eosinophiles, 1.5 per cent.; myelocytes, 1 per cent. In counting 200 leucocytes he found 8 normoblasts and 8 megaloblasts. Microcytes, macrocytes and poikilocytes were numerous, and polychromatophilic degeneration was marked.

The second case is peculiar in that two other children in the same generation had died from a similar condition. Jewett's patient was apparently well until four months old, when he developed anæmia, which became profound, enlargement of the spleen, emaciation, diarrhœa, slight, irregular fever and great debility. There was no enlargement of the lymph glands, and no history of hemorrhages. The patient was seven months old when first seen, and the blood count at

¹ Philadelphia Medical Journal, April 27, 1901.

that time showed 1,150,000 red cells ; 33,000 white cells ; 20 per cent. hæmoglobin. (Fleischl). The large and small lymphocytes amounted to 78.6 per cent. ; polymorphonuclear neutrophiles to 18.2 per cent. ; eosinophiles to 1.8 per cent. ; myelocytes to 1.4 per cent. In counting 500 leucocytes 14 normoblasts were found. No megaloblasts.

The author thinks that in spite of the frequency with which a high percentage of lymphocytes, numerous nucleated red cells, and splenic tumor are found in the severe anæmias of infancy, the preponderance of the lymphocytes in these cases, together with the absence of all evidences of tuberculosis, syphilis, and rhachitis, justifies the diagnosis of a true lymphatic leukæmia of a subacute variety.

Attempts have long been made to show a parasitic cause for leukæmia which, from its course and termination, presents many of the characteristics of an infection. The best known of the advocates of this theory is Löwit, whose investigations on the subject cover several years and whose publications are numerous. In his last paper¹ he gives a résumé of his previous work, and repeats his former statements regarding the parasite, which he believes to be the specific cause of the disease. By a special method of staining Löwit claims to find in myelogenous leukæmia a large amœba—"hæmamœba leukæmiæ magna"—which is present in the lymphocytes or free in the blood. In lymphatic leukæmia the "hæmamœba leukæmiæ parva" occurs chiefly in the blood-making organs, though rarely it may be seen in the peripheral circulation. By intravascular injection of leukæmic blood he claims he has been able to bring about in animals a chronic condition resembling leukæmia and to demonstrate in these animals the protozoa. The method of staining he has last given differs somewhat from the one first advised. The blood is spread on the cover-glass with the finger-nail, as too thin a layer is injurious to the white cells. It is fixed by heating for two hours at 120° C., stained in a concentrated watery solution of thionin (Muehlheim) with heating, washed in water, dried, counter-stained in Orth's "lithioncarmin." After again washing in water and drying, it is mounted in balsam. The various forms of the amœba at the different stages, as well as the methods of inoculations into animals, have been treated of before, and need not be mentioned again.

Naturally there are many who disagree with this idea and who believe that the so-called amœbæ are in reality artefacts. Türk² has been most persistent in his opposition to the theory of Löwit. Türk thinks that the amœbæ result from the action of the staining material of the granules of the "mastzellen," and has been able to find similar

¹ Zeitschrift f. Heilk., 1901, Band xxii.

² Berliner klin. Wochenschrift, 1901, No. 38, and Ziegler's Beiträge, 1901, Band xxx.

forms in the blood of non-leukaemic individuals. More recently Hirschfeld and Tobias¹ have come to the same conclusion as Türk. They employed the stain formerly advised by Löwit, fixing for two hours at 120° C., staining for half an hour in a mixture of one part saturated watery solution of thionin and two parts Loeffler's methylene blue, washing in water and differentiating for twenty seconds in a solution of iodine one part, potassium iodide two parts, water 300 parts. By this method they were able to observe figures which resembled those described by Löwit, but which did not show the olive-green color said to be characteristic, nor were any ciliated, umbilicated or sporulation forms met with. The figures found in the large mononuclear cells they believe to be in part a precipitation of the stain, and in part degeneration products of protoplasm and the nucleus. The larger figures found in the small polynuclear cells and in many small mononuclear cells they look upon as "mastzellen" granules that were deformed by the method employed. They found that the number of so-called parasites was in direct proportion to the number of "mastzellen" present. In the blood-making organs of these patients no protozoa were found, and animals injected with the juice from these organs developed no condition resembling leukaemia, and neither in the blood nor organs of these animals could the protozoa be demonstrated.

MYELOGENOUS LEUKAEMIA AND TUBERCULOSIS. The combination of leukaemia with tuberculosis is an extremely rare condition, and on this account deserves mention. Elsner and Groat² report a case of myelogenous leukaemia complicated by tuberculosis in which the total number of leucocytes diminished with the appearance of the tubercular manifestations, and there was a change in the percentage proportion of the white cells. The polynuclear neutrophiles and the lymphocytes showed a proportional increase, while the myelocytes showed a decrease. In the beginning the white cells numbered 320,000, while at the termination only 121,000 could be counted.

A similar case is published by Sturmdorf.³ The patient when first examined showed evidences of phthisis, and there was a laryngeal involvement as well. The peculiar feature of the case to which Sturmdorf calls attention is the change which took place in the proportion of the myelocytes and polynuclear cells during the febrile attacks to which the patient was subject. In the first count the total number of leucocytes was 456,000, of which 53.20 per cent. were myelocytes; 29.70 per cent., polynuclear neutrophiles; 8.80 per cent. eosinophiles; 7.50 per cent., lymphocytes. At a subsequent examination, made when

¹ Deutsch. med. Wochenschrift, 1902, No. 6.

² American Journal of the Medical Sciences, March, 1901.

³ Ibid., August, 1901.

the temperature was 103.5° F., the myelocytes were only 31.25 per cent., while the polynuclear neutrophiles were 54.25 per cent. The total number of the white cells and the percentage of the other cells remained about as before. On two other occasions he was able to observe this same effect of the temperature—with low temperature the myelocytes remaining high, while with an elevation the polynuclears increased. Sturmdorf thinks that the increase of the polynuclear cells in the febrile period indicates an intercurrent leucocytosis.

A third case has been reported by Hirschfeld and Tobias,¹ who have been able to collect ten cases (not including that of Sturmdorf), making the total of the cases so far published only twelve. In their patient the effect of the tuberculosis was to lower the total number of the leucocytes, but not to such a marked degree as in the case of Elsner and Groat. The variation in the temperature did not have the effect recorded by Sturmdorf. They conclude that tuberculosis may develop in the course of a leukaemia without the point of entrance being demonstrable at the time, or that a latent tuberculosis may be brought to renewed action by the effect of the leukaemia.

Splenic Anæmia. Whether there exists a disease that justifies the use of the term “splenic anæmia” remains an open question, and the burden of proof must rest on those who advocate the use of the name.

Warren,² in discussing the surgery of the spleen, devotes considerable attention to this subject. He looks upon “splenic anæmia” or “splenic pseudoleukaemia” as a distinct clinical entity which admits of a diagnosis and is amenable to treatment by removal of the organ.

In connection with the term splenic pseudoleukaemia which Warren uses, and which was also employed by Sippey, following previous writers, I cannot withhold stating that this is done with no justification in the pathological findings. I have repeatedly here and elsewhere emphasized the point that the spleen in pseudoleukaemia presents certain features more or less characteristic of this disease, and to be confounded only with the appearance of the organ in leukaemia. There is no case, so far as I know, among the recorded instances of so-called splenic anæmia in which these pathological features were discovered, and the use of the term pseudoleukaemia has therefore no justification. It was originally employed, as systematic writers have generally pointed out, by Horatio C. Wood at a time when the knowledge of the different forms of blood disease and splenic disease was very fragmentary. Quoting the cases reported by Osler and Sippey as the only ones that seem to be characteristic, Warren gives the following as the clinical course of the disease: It occurs in young adult life, and is sharply distinguished from the

¹ *Loc. cit.*

² *Annals of Surgery*, May, 1901.

anæmias of infancy, many of which are associated with enlargement of the spleen. The onset is insidious, with slight pallor and dizziness, soon followed by the splenic enlargement. There is rarely much pain or tenderness referable to the affected organ, although sensitiveness in this locality may draw attention to the tumor before the anæmia is marked. At this stage nausea, vomiting, and diarrhœa may occur, as well as epistaxis and dyspnœa. The tumor increases outward and downward, causing symptoms from its weight; the growing anæmia manifests itself by debility, fatigue, œdema of the feet, and occasional rise of the evening temperature. With progress of the disease the skin loses its extreme pallor, becoming yellowish or, as in a case of Osler's, even brownish. Ascites may develop in the later stages, and petechiæ and even extensive hemorrhages from the stomach and intestines. Finally, protracted diarrhœa follows, and death from exhaustion closes the scene. The lymph glands are not enlarged. The blood first shows a drop in hæmoglobin not shared in by the red cells to such a marked extent. Later there is an extreme reduction in both hæmoglobin and erythrocytes, and finally occur the changes in size and shape along with the appearance of the nucleated forms that characterize a grave anæmia. The coagulability of the blood is diminished, and the anæmia is only little short of pernicious. The leucocytes are, as a rule, actually and relatively diminished in spite of the great diminution in the number of the red cells. The differential count shows a normal ratio between the mononuclear and polynuclear cells, though the former may occasionally be slightly increased. There are usually no myelocytes. The blood should always be examined, and its diagnostic worth consists in its lack of any special characteristics, thus excluding the other more easily recognized diseases.

PATHOLOGY. The spleen is always enlarged, generally to five or ten times its normal size, the consistency is increased, and on section areas of connective tissue are described as replacing the pulp reticulum with firm tissue. Atrophy and sclerosis of the Malpighian bodies were noted by Banti.

The case reported by Warren is briefly as follows: The patient, a male, aged twenty-six years, was first seen in consultation in September, 1899. His father had died from a gastric tumor and a brother from phthisis. The patient had had pleurisy five years before. His habits had been good, and he denied venereal infection. He had not had malaria. The first symptoms appeared in September, 1898, with diarrhœa, the bowels moving four to five times a day, associated with tenesmus. There was distress after eating that occasionally caused vomiting. At times he had regular chills, with vomiting. For several months previous to the time of observation he had lost flesh and had

been unable to work, but the splenic enlargement had only been noticed in August, a month before the examination. It was about the size of a grape-fruit. In 1900, a year later, the tumor had increased greatly in size, extending across the median line and as far down as the umbilicus. There had been loss of flesh, and some dyspnoea was present, but the general condition was good.

The patient was admitted to the hospital October 6, 1900. Nothing abnormal was found in the chest. The abdomen was soft, the tumor moved with respiration, and there was no tenderness. The blood examination showed: red cells, 5,200,000; white cells, 2200; hæmoglobin, 65 per cent. Differential count: polymorphonuclear neutrophiles, 70 per cent.; lymphocytes, 22 per cent.; eosinophiles, 3 per cent.; megaloblasts, 0.07; normoblasts, 0.01.

Three days after admission the patient had a chill, the temperature rising to 101° F., but no plasmodia could be found in the blood.

The spleen was removed on October 16, 1900. There was considerable pain following the operation, and the patient suffered from shock for the first few days. The first blood count, made on the 18th, showed an increase in the leucocytes to 24,000, the polynuclear cells being 93 per cent. and the mononuclear cells 6.8 per cent. On November 18th there appeared a phlebitis of the left saphenous vein, which readily responded to treatment. During the patient's stay in the hospital there was an evening rise of temperature, which persisted for a week or two after he returned to his home. When last seen, March 18, 1901, the patient had gained much in weight and felt perfectly well. During the period of convalescence frequent examinations of the blood were made. At all times an increase over the normal number of leucocytes was found, varying between 24,000 and 15,000 per c.mm. The last count, made on January 23, 1900, showed 16,000 white cells. The percentage of polynuclear cells remained rather high, while the mononuclear cells were correspondingly diminished.

The examination of the spleen, as made by Dr. Whitney, was as follows: size of organ, 21 by 16 by 8 centimetres; weight, 1155 grammes; outline normal except for the indentation made on the anterior surface by the ribs; capsule smooth and of normal color; no change in the vessels at the hilus. On section the surface was of a uniform red color, the follicles were indistinct, and the trabeculæ prominent.

Microscopical examination showed the vascular openings well marked, follicles small and infrequent and rather irregular in outline. The embryonic centres were marked by large cells, with an occasional one showing nuclear figures. The spleen pulp was characterized by the thickness of the reticulum, the smallness of its meshwork, and by the

relatively small number of cells in the spaces. No phagocytic cells were found. The spaces contained a moderate number of red corpuscles. Only occasional eosinophiles were found. The enlargement of the spleen seemed to be entirely in the growth of the pulp, with hypertrophy of the reticulum.

Under the title of "Primary Splenomegaly," Brill¹ reports three cases of splenic enlargement occurring in one family. Neither the parents nor grandparents of these patients had had splenic enlargement. In the generation from which the cases of Brill were obtained there were six children. Of these the eldest is alive and well; the second died of marasmus at the age of three; the third is one of the cases reported; the fourth is in good health; the fifth is also reported; the sixth died at the age of nine from an enlargement of the spleen, probably of the same character as the one described.

A brief account of these cases is of interest. The patient was thirty-four years of age; she was first seen in 1885, but there was no occasion at that time for an abdominal examination. In 1888 she first noticed a mass on the left side of the abdomen, which occasioned no discomfort. This was found to be an enlarged spleen that extended three fingers' breadth below the costal margin and anteriorly to the parasternal line. The liver and lymphatic glands were not increased in size. She remained under treatment for two years, with no change in the condition. She was next seen in 1895. During the period intervening the spleen had increased in size, she had had two attacks of pleurisy and had developed a tendency to sweating, accompanied by sudamina. The sudamina in 1896 was hemorrhagic in character. Menstruation was normal. The first blood count was made in 1895, showing red cells, 4,800,000; white cells, 7168; hæmoglobin (Gowers), 80 per cent.

During the summer of 1896 the patient passed through an attack of typhoid fever, which ran a normal course. The spleen was softer at this time, but there was no change in size. The physical examination was made on December 14, 1896. The patient was small, the skin had a peculiar yellowish color (not like icterus), with a tendency to wrinkle like the skin of an old woman. The remains of the hemorrhagic sudamina were seen as dark pigmented spots. There were no glandular enlargements. Gums were spongy and inclined to bleed, but the mucous membranes were not pale. There was a wedge-shaped, yellow patch on the sclerotic of each eye, extending from the corneal margin to the canthus, which did not resemble a pinguicula. The liver extended from the fourth rib to 3 cm. below the costal margin, and was tender to the touch. The spleen could be felt beyond the median line, and showed

¹ American Journal of the Medical Sciences, April, 1901.

a distinct notch. Blood count at this time : red cells, 3,800,000 ; white cells, 6400 ; hæmoglobin (Gowers), 65 per cent. There were multinuclear cells, 65 per cent. ; large mononuclear, 5 per cent. ; small mononuclear, 30 per cent. No poikilocytosis.

Up to the present time there had been a gradual increase in the size of the spleen, progressive emaciation, and an infrequent tendency to bleed from the gums. The temperature was normal and the blood picture remained unchanged.

The second case was a brother of the patient just described. He had been examined frequently by Dr. Brill, so that it is certain that no splenic enlargement existed up to 1889. At this time the patient, though feeling well, wished to be examined as to the condition of his spleen. This was found to be palpable on deep inspiration. His skin was moist and covered with sudamina, and over the nose and cheeks was an erythematous patch. He said that he sweats easily. The other organs were normal. Under treatment with arsenic the spleen diminished in size. In July, 1890, there were repeated attacks of epistaxis and a renewed outbreak of the erythema, both of which abated under arsenic.

In August, 1893, the attacks of epistaxis and erythema recurred and the spleen became palpable below the ribs. Under iron and arsenic this disappeared. The blood count at this time was normal. The condition remained unchanged until May, 1898, when the spleen began to enlarge, and the patient lost in weight. Since October, 1899, the peculiar yellow patches had developed on the conjunctivæ, and the liver had increased in size. During this period frequent blood examinations failed to show an anemia. In August, 1900, he had an attack beginning with chill and fever, followed by a diarrhoea, the stools passed containing blood and mucus. During the convalescence from this there was an outbreak of a hemorrhagic furunculosis similar to that affecting the sister. At the last examination, made October, 1900, considerable emaciation was found, and the skin was of a peculiar brownish-yellow color. The spleen reached beyond the median line, and the liver extended 6 cm. below the costal margin. Both organs were smooth. Blood count showed at this time : red cells, 3,800,000 ; white cells, 5120 ; hæmoglobin, 55 per cent. The differential count gave 54 per cent. of polynuclear neutrophiles ; 10 per cent. large mononuclears ; 36 per cent. of small mononuclears ; 0.25 per cent. of eosinophiles. No nucleated red cells or poikilocytes were found.

Brill thinks that the symptom-complex of these two cases is sufficient to exclude them from splenic anemia of the ordinary type. The distinctive features he sums up as follows : The family relation. The enormous enlargement of the spleen with the less marked increase in

the size of the liver. The profuse perspiration and sudamina. Absence of anæmia for ten years after the onset of the disease. Tendency to hemorrhage. Peculiar brownish-yellow color of the skin. Long duration of time. The yellow wedge-shape thickening of the corneal conjunctiva. The feeling of comfort in spite of the size of the spleen.

My own views in regard to the so-called splenic anæmia have been repeatedly stated in *PROGRESSIVE MEDICINE* and elsewhere, and scarcely require repetition. Wentworth¹ has gone over the subject with great care under the title of the "Association of Anæmia with Chronic Enlargement of the Spleen," and he discusses practically all of the literature under the following sub-headings :

(1) Anæmia splenica (Splenomegalie Primitive). (2) Anæmia splenica infettiva dei Bambini (Anæmia Splenica Infantile). (3) Anæmia Infantum Pseudoleukæmia. His views are for the most part closely in accord with mine, and I append the conclusions at which he has arrived :

1. The blood changes in cases of so-called anæmia splenica are those of a secondary anæmia. The degree of anæmia varies in different cases.

2. The degree of cachexia which has been described in these cases does not always correspond to the blood changes, which are often moderate rather than severe. The percentage of hæmoglobin frequently is over 50 per cent. In one of Banti's cases it was 68 per cent. The number of red cells is often more than 3,000,000. It is obvious that the cachexia does not depend on the diminished number of red cells and the quantity of hæmoglobin. It is not improbable that the cachexia and other symptoms are produced by cancer, tuberculosis, etc., and that the splenic and blood changes are merely two of the results which are thus produced. The source of the intoxication is unknown, and it is very probable that it may come from various sources.

3. It is not easy to see how fibrous changes in the spleen can produce toxin. Fibrous tissue can interfere materially with the functions of an organ, as in cirrhosis of the liver or in interstitial nephritis. But there is no analogy between these organs and the spleen. Fibrous tissue in itself cannot be considered as being capable of producing toxic or other substances. It can produce mechanical disturbances by interference with the circulation ; or from the increase in size which it may produce in an organ ; or by interference with the functions of an organ through injury of its cells. We know that the splenic functions, what-

¹ Boston Medical and Surgical Journal, October 3, 10, 17, 24, and 31, 1901.

ever they may be, are not essential to life, or apparently to the health, of an individual, and, so far as it is known, after the removal of the spleen the functions of that organ are not performed by other organs. Therefore, the mere interference of function from an overgrowth of connective tissue in the spleen could not produce the symptoms described as characteristic of *anæmia splenica*. The functions of the spleen are in no way analogous to those of the thyroid and suprarenals.

4. If it were possible for fibrous tissue to produce toxic substances, it is difficult to account for the absence of such substances in connection with chronic hyperplasia of the spleen when associated with a variety of well-known causes. In these cases the lesions in the spleen are identical with those described by Banti as characteristic of *anæmia splenica*.

5. It has been stated that the splenic alterations are primary and precede all of the other symptoms. This statement requires further observation to confirm it. Bruhl remarks that the splenic enlargement may come before or after the *anæmia*. The lesions in the spleen are characteristic of chronic hyperplasia, a condition which is associated with a number of abnormal conditions in various organs, and which frequently give rise to no symptoms, or in other cases cause such symptoms as may be produced by the size and weight of the organ.

6. The lesions found in the spleen in cases of so-called splenic *anæmia* do not warrant the statement made by Banti and others that this condition is related in any way to *pseudoleukaemia*. There is no analogy between the hard granular form of malignant lymphoma and the lesions of chronic hyperplasia in the spleen. In addition, it may be said that considerable uncertainty exists as to the nature of the hard form of malignant lymphoma, and its classification is a matter for discussion.

7. A tendency to generalize from observations made on one or two cases is to be deplored. In the case of splenic *anæmia* nothing characteristic of a primary disease has been discovered in any organ or in the blood. The number of cases, small as it is, unquestionably shows a diverse etiology. The investigations have been very incomplete, and most of the statements depend on clinical observations. No better proof of a varied etiology is needed than is found in Banti's own cases.

In his article he quotes here Stengel¹ on splenic *anæmia*: "The observations warrant our disregarding entirely the term splenic *anæmia*. I do not know of the existence of a separate disease that we may dignify with this title or with such names as 'primary splenomegaly.' The condition of the blood and the characteristics of the spleen do not

¹ Journal of the American Medical Association, 1897, vol. xxix, p. 162.

differ from those met with in well-marked secondary anæmias or splenic enlargement."

8. The evidence is conclusive that anæmia infantum pseudoleukæmia is a secondary anæmia and that it owes its peculiar symptoms and blood changes to the occurrence of severe anæmia at an early age.¹

9. There is little doubt that anæmia infantum pseudoleukæmia and anæmia splenica infettiva are identical conditions, and there is even less proof that anæmia splenica infettiva is a primary disease of the spleen than that anæmia infantum pseudoleukæmia is a primary disease of the blood.

10. There is no apparent connection between the character of the blood and the splenic changes in infancy. Cases with identical lesions—namely, in the chronic hyperplasia—show varying degrees of anæmia. At times there are marked changes in the blood, and at others the changes are slight. The degree of leucocytosis varies in the same way. In some cases it is considerable, in other cases the number of leucocytes is normal or even diminished.

11. These differences cannot be explained by the duration of the condition in many of the cases. All that one is justified in concluding about these secondary anæmias of infancy is that in some cases there occurs a chronic hyperplasia of the spleen, and in others the spleen is not altered.

12. The names anæmia splenica, anæmia splenica infettiva, and anæmia infantum pseudoleukæmia are objectionable, because they are misleading. Anæmia splenica has been used for many years as one of the synonyms of pseudoleukæmia, and should not be used to describe conditions that are in no way related to pseudoleukæmia. No evidence has been furnished that justifies the use of the word "primary" in connection with splenomegaly. The same may be said of the word "infettiva" (infectious) in connection with the infantile form of splenic anæmia. Anæmia infantum pseudoleukæmia is a secondary anæmia of infancy, and in no way related to pseudoleukæmia.

SCURVY.

The Etiology of scurvy has remained unsettled to the present date. The earlier investigations into the dietary causes led to the assumption that alteration in the food or insufficiency in certain classes of food accounts for the development of the disease. More recently the tendency has been toward the bacteriological theory. Lamb² has made

¹ Author quotes Stengel, *Twentieth Century Medicine*, 1896, vol. vii. p. 460.

² *Lancet*, January 4, 1902.

some investigations and has reviewed some of the later contributions to the etiology of the disease.

A. E. Wright¹ advanced the theory that scorbutus was an acid intoxication brought about by a dietary of food-stuffs which contained a large excess of mineral acids over the bases—a dietary of meats, especially salted meats, and cereals, to the exclusion of green vegetables, tubers, and potatoes.

This acid intoxication he compared to the condition of acid intoxication which can be experimentally produced in herbivora by the ingestion of a surplus of mineral acids.

In the *Lancet* (August 25, 1900) Wright reported seven cases of scurvy, in all of which he was able to demonstrate a diminution of the alkalinity of the blood, and in all he obtained marked improvement by the use of lactate of soda. This theory has been disproved by Lamb's discovery of normal alkalinity of the blood serum in cases in which the symptoms of scurvy were well marked. A second theory recently offered is that of W. C. Liston,² who reported four cases of scorbutus, in all of which the ova of the ankylostoma duodenalis were present in the feces in large numbers. Liston therefore suggested these parasites as the causal factor in the disease. This theory is so manifestly unreliable that it will meet with little encouragement. It must not be forgotten that the ankylostoma frequently occurs in the intestinal tract in individuals perfectly normal, and that the discovery therefore of eggs does not constitute an evidence that this parasite is the cause of a diseased condition that happens to be present. A specific disproof of its relation to scurvy is offered by Lamb, who searched for ova in a number of his cases without success. Further, it may be added that scurvy is a disease very common in countries where ankylostoma is unknown.

Finally, the old theory of decomposed food has been revived by Jackson and Harley,³ who look upon scurvy as a condition of ptomaine poisoning produced by eating tainted animal food, a theory which was first advanced by Torup. They believe that fresh vegetables and lime-juice will neither prevent nor cure the disease.

The investigations of Lamb comprise 11 cases of scurvy. Of these, 5 cases developed in a Bombay jail, where the patients had long been imprisoned and the diet^a was the same as that given to 1095 of the prisoners. As the meat^b given the patients was eaten on the same day that it was killed, and was only given once a week, and the meat-inspection was a rigid one, the author thinks the ptomaine theory can be excluded. In all these 5 cases the alkalinity of the blood was carefully determined. From these 5 cases the author concludes :

¹ Army Medical Report, 1895.

² Indian Medical Gazette, October, 1900.

³ *Lancet*, April 28, 1900.

1. There was no marked deficiency in the alkaline food-stuffs of the dietary before the onset of the symptoms. The diet was common to about 1095 prisoners, and of these only the 5 developed the scorbutic symptoms.

2. There was no diminution of the alkalinity of the blood serum when the symptoms were well marked.

3. There was no improvement of the symptoms either as a result of the giving of a diet consisting of abundant alkaline food-stuffs or on the administration of large doses of lactate of soda.

No ova were found in the feces of these patients.

The other 6 patients were from outside, and were admitted to the hospital after the onset of the disease, so that the previous diet could only be learned from questioning. In the feces of 2 of these 6 patients ova were found; in 1 case, out of three slides examined, one ovum of the *trichocephalus dispar*, one ovum of the *ascaris lumbricoides*, one ovum of *dochmius duodenalis*. In the other case one ovum of the *trichocephalus dispar* was found. The feces of the remaining 4 patients showed nothing. The results of investigation in these cases were on a par with those of the first five.

He concludes that while in some cases of scorbutus there may be an acid intoxication, it was not present in his cases. There would seem, in fact, more than one etiological factor and pathological condition underlying the symptoms which are clinically known as scurvy.

The bacteriology of scurvy has also been made the subject of investigation by Müller,¹ who found in two out of three cases of scorbutus an organism in the urine that resembles in many points a bacillus described by Babes in 1893, which he cultured from the gums. Urine was removed from the bladder with all usual precautions. On bouillon there appeared in two days a growth resembling in a measure that of a streptococcus. The organism grew well on sheep's blood, and could be distinguished from the streptococcus present by the formation of round, brownish colonies. It could not be transferred from bouillon to glycerin-agar; it grew sparingly on gelatin at 22° C. Transferred from blood serum to glycerin-agar it grew sparingly. In grape-sugar agar no gas was formed. It did not change litmus. No change was produced by its cultivation in milk. Five-day cultures injected in a rabbit produced no results. He does not decide whether this bacillus stands in a causal relation to scorbutus.

Infantile Scurvy has become much more widely known in recent years, and the diagnosis is therefore made much more frequently. Cases, however, are still overlooked. Peirson² describes the differen-

¹ Münchener med. Wochenschrift, November 12, 1901.

² Boston Medical and Surgical Journal, October, 1901.

tial diagnosis between this condition and rheumatism, rhachitis, purpura, and syphilis. Diagnostic points of infantile scurvy are : (1) Age usually under two years. (2) Absence of fever. (3) Pain, which is early and constant ; child lies with the head flexed and rigid ; pain is first in the legs, then in the back and arms ; pain increased on motion. (4) Swelling at the lower end of the diaphysis of the femur, very tender to touch, but neither red nor hot. (5) The bleeding from gums, stomatitis, hemorrhage from nose, bowels, etc., come later.

The pathology consists in the subperiosteal and other hemorrhages and the anæmia. From rheumatism it is diagnosed by the fever, swelling in joint, which is red and hot. Rheumatism is rare under two years. In rhachitis there is chronic, painless swelling of the epiphyses and the presence of rosary and head deformities.

It should be remembered, however, in connection with all such discussions of differential diagnosis, that atypical cases offer the greatest difficulty in diagnosis ; for example, rheumatism in childhood frequently presents no swelling of the joints. The diagnosis, therefore becomes doubtful or uncertain.

PURPURA.

Purpura of Tuberculosis. In its various forms purpura is now recognized as a condition secondary to various diseases. In most instances it is an expression of some form of infection. It is not surprising, therefore, that purpura is met with in a variety of conditions. Its association with pulmonary phthisis is not frequent, but has been noted by a number of writers, and in the terminal cachectic stages of the disease is not particularly rare. Cohen¹ describes the case of a nineteen-year-old girl whose father died of phthisis. Ten days before admission she first noticed a blister-like eruption on her legs, unaccompanied by any painful sensation, and at the end of a week the legs felt heavy and began to show œdema. On admission the temperature was 37° C.; pulse, 96. A painful gland was felt under the jaw ; moderate œdema appeared on the legs ; the joints were free. On both legs was an eruption of spots, varying in size from a pin-head to a pea. In some places they were confluent. Only a few were found on the body and none on the face. They did not disappear on pressure. Lungs showed no abnormality ; there was no cough or expectoration. Blood and urine were normal. Heart dulness reached beyond mammary line on the left and mid-sternum on the right. The first sound was murmurish. Cultures of blood were nega-

¹ Münchener med. Wochenschrift, 1901, No. 50.

tive. On December 14th she vomited pale-colored fluid containing a blood clot. The spots of eruption, at first quite hemorrhagic, grew paler, and were replaced by new ones. On December 18th the patient complained of great pain in her abdomen, and signs of shock were present. The temperature was 36° C.; pulse, 120. There were no local signs. A hemorrhage appeared on the back of the hand. On December 19th the patient was better; numerous hemorrhagic spots appeared on the elbow, on the mucous membrane of mouth, gums, soft palate, and also on the body. Later on hemorrhages appeared under an ice-bag which had been placed over the heart, also on abdomen. On January 5th bloody stools were passed. On January 13th signs of hemorrhagic nephritis appeared, while on February 9th the involvement of the lungs became manifest. Tubercle bacilli were found in the sputum. The urine contained no bacilli. Autopsy showed advanced phthisis of both lungs. The heart was small, and no abnormality. Abdominal sera smooth; spleen normal in size and soft. Liver enlarged; nutmeg on section. Kidneys showed fatty degeneration, with numerous small hemorrhages. Adrenals normal. Intestines: Peyer's patches swollen and two small ulcers near opening of appendix.

In some of these cases of purpura complicating phthisis or other diseases blood cultures have proved negative, as reported by Cohen; in others organisms of various sorts have been discovered. While the presumption is always in favor of some infection, other factors must be considered in certain instances. The case just referred to has the general features of an infectious purpura, though the nature of the organism is doubtful. Tubercle bacilli may, perhaps, in certain cases occasion a hemorrhagic tendency, though this must be exceedingly rare. Another instance of purpura associated with tuberculosis was reported by Pratt.¹ The patient was admitted to the hospital with fever and slight cough. Nothing was found in the lungs. Three weeks after admission he had nose-bleed. The Widal test was tried, but was negative. Two days later, April 23d, hæmaturia appeared and the epistaxis continued. A few râles could now be heard over right apex. On April 26th blood appeared in the stools; on April 27th two or three purpuric spots appeared on the back. The patient's condition grew worse. The purpuric spots appeared on chest, abdomen, and lips. The parotids suppurated. Death occurred on the 27th, when the whole body showed the purpura. Autopsy showed extensive tuberculosis of lungs, spleen, pleura, and intestinal tract. Condition of the heart not mentioned.

Purpura Associated with Lobar Pneumonia. This combination is a much more frequent one than that of purpura and tuberculosis. In

¹ British Medical Journal, September 28, 1901.

virulent cases of pneumonia purpuric eruption may occur with or without an intervening malignant endocarditis, and the pneumococcal infection itself is quite sufficient to explain the purpura in most instances. Underwood¹ reports a case in point. His patient was a boy, aged four and a half years. There was a tubercular history.

The patient was first seen on February 7th, when left lobar pneumonia was diagnosed. An erythematous rash was present for a day or two, and a slight lameness of the left ankle was present throughout the attack. Crisis occurred on the tenth day. During convalescence the epidermis exfoliated in fine, dust-like particles.

The patient was not seen from February 20th until March 2d, but during the intervening period he had appeared well, though not strong. At this time he was found with an epistaxis which had existed since the previous evening. Hemorrhage from the bowels had also occurred, as the stools contained tarry matter mixed with bright blood. Purpuric spots were present on the limbs, body, and the mucous membranes of the mouth, palate, tongue, and lips. The face was free.

The bleeding from the nose continued intermittently until March 11th, when he began to show a temperature, accompanied by cough and sweating. From the 13th to the 15th there was slight hæmoptysis and some oozing from the gums. There was no more hemorrhage after this, and recovery was complete.

The epidermis was again exfoliated, but this time in large plaques. No hæmaturia or albuminuria occurred at any time. From the prolonged epistaxis, extreme anæmia, bloody stools, extravasations into the mucous membranes of the mouth and throat the author made a diagnosis of Werlhof's disease.

BLOOD EXAMINATION. No count was made, but he thinks, from the smear, that there was a polymorphonuclear leucocytosis present. He found in the smears a large number of colorless, highly refractive granules that stained with a faint tinge of purple, if at all. The majority of these were extracellular, but in very many cases groups of 2 to 6 to 8 granules lay within or partly within the red cells, the latter being at times distorted as if extruding them.

In some cases similar granules were seen just within or on the margin of the polynuclear leucocytes. Nucleated red cells were common, mostly normoblasts; a few megalocytes were found and still fewer poikilocytes. The author thinks that these granules are identical with the "blood dust" of Müller. He quotes Stokes and Wegefarth and Nicholls as saying that these granules are certainly derived from the leucocytes, and that they and leucocytes possess bactericidal properties.

¹ American Medicine, October 19, 1901.

He believes that the free granules are derived from the nuclei of the red cells when such are present, as well as from the leucocytes.

HÆMOPHILIA.

No new facts have been discovered regarding the nature of this condition. Its relations to some of the other hemorrhagic diseases, like purpura and the hemorrhagic diseases of the newborn, are becoming a little more clear, but there remains a great deal of uncertainty.

The Joints in Hæmophilia. The joint affections of hæmophilia are of particular interest from the point of view of diagnosis and of classification. The well-known articles of König contain the most satisfactory discussion up to the present time. He divided the disease into three stages: (1) Hemarthrosis, the stage of blood effusion; (2) panarthrititis, the stage of inflammation; and (3) the stage of contraction. In the first stage the joint is filled with fluid blood and blood clot. The inner surface of the synovial membrane is rose-red in color, later becoming brownish from old pigment. The capsule of the joint shows a serous infiltration. In the course of continued bleeding there is a deposit of fibrin on the inner surface of the synovial membrane and on the joint cartilages. Later comes the formation of villous-like processes from the synovia, along with a fraying out of the joint cartilages, giving rise to peculiar defects in the cartilage. In the second stage the joint cavity contains a brownish or serous fluid. The synovia are only slightly thickened, and are covered by numerous floating, thread-like, brownish villi, most frequent on the folds of the membrane and the crucial ligaments. The surface of the cartilage shows degenerative changes, so that in spots the bones are laid bare. Bony outgrowths, such as are found in rheumatoid arthritis, are not present. The third stage shows adhesions of joint surface where the cartilage is deficient, with small pockets containing a brownish fluid. The bones show no change.

SYMPTOMS OF FIRST STAGE. The history, the slight amount of traumatism to bring about the condition, the swollen joint, with bluish-black spots on skin, the absence of pain, the lack of interference with motion are characteristic. There may or may not be a transitory elevation of temperature. Without a family history the diagnosis is difficult.

SECOND STAGE. This resembles tubercular joint disease and results from lack of care with frequent effusions into the joint. Development is gradual. The diagnosis from tubercular disease is often impossible clinically. Rosenbach,¹ in his article, practically follows König's

¹ Ebstein-Schwalbe, *Handbuch der praktischen Medicin*, 1901.

classification. According to this author the diagnosis rests on the sex, usually a male in hæmophilia, young, pale and relaxed; the presence of other deformed joints showing previous attacks; the observance of new effusions accompanied by the bluish ecchymosis, the history, etc., as above. The third stage shows the same picture as tuberculosis.

TREATMENT. In the first stage rest, with moderate compression. Later, when the joint is painful and swollen, there is a question whether puncture is advisable or not. The author has done puncture once without any hemorrhage, while König reports three similar cases. The treatment of the third stage is discouraging, as attempts to regain mobility must be made with great caution.

The management of hæmophilia consists almost solely in local measures designed to control the hemorrhage. Some authors, however, have advised internal treatment to increase the coagulability of the blood, and thus diminish the tendency toward hemorrhage. Thus J. W. Ballantyne¹ advises antenatal treatment and reports a case of a woman whose family history was as follows: Her maternal uncle died at the age of eleven from bleeding. Of her four brothers, one died at the age of twelve from bleeding. The others are alive and healthy. Her four sisters are healthy, as are their male offspring. None of the brothers' children are bleeders. At the birth of her first child she lost much blood, and the child was pale and anæmic. This boy was a bleeder. The second labor showed masked hemorrhage. The child bled from the cord; bruised easily, and died at the age of twelve months, during dentition, of cerebral hemorrhage. In the third pregnancy she came under the care of the author. She was given chloride of calcium for the three months preceding delivery in 10-grain doses, t. i. d., along with iron, arsenic, and strychnine. The following labor was normal. No hemorrhage from mother or child. The child was of good color and has since been healthy. While the author says that to draw conclusions from this case is impossible, he advises this line of treatment under similar conditions.

Wright, who first advocated the use of calcium chloride to increase the coagulability of the blood, employed it in a few cases of hæmophilia and claimed that the coagulation-time was materially lengthened. In some clinical cases reported here and there since his publications good results have been obtained, but, on the whole, the calcium treatment of hemorrhagic diseases, as well as of aneurism, has been less satisfactory than promised to be the case. In a recent case under my observation, in which gelatin solutions were injected subcutaneously, considerable hemorrhage occurred from the needle punctures made in the injections.

¹ Journal of the American Medical Association, August 24, 1901.

Various local applications have been used in hæmophilia with occasionally brilliant results. Suprarenal extract is the most recent addition to the list of remedies employed in this way. McKenzie¹ reports the successful use of suprarenal extract locally in nose-bleeding of hæmophilia. Three 5-grain tablets were dissolved in water and allowed to settle, and a tampon of cotton soaked in clear fluid and applied.

In connection with the use of gelatin in the control of the hemorrhages in hæmophilia, the experience of Holt Schmidt² is interesting. He reports five cases successfully treated by injection of 15 c.c. of a 2 per cent. gelatin solution in normal salt solution. All aseptic precautions were taken, and only half the 15 c.c. was given in one place, thus avoiding too great tension of tissue. In all cases the gelatin was quickly absorbed without any local ill-effect. When the first injection did not control bleeding a second was given on the same day. He prepared his solution by adding 20 grammes of ordinary gelatin to 1000 c.c. of physiological salt solution. This was boiled for six hours. On cooling it solidified, and it could thus be preserved. To use, heat to body temperature, when it becomes liquid.

Hemorrhage in the Newborn. Reference has been made to hemorrhagic disease of the newborn. In many cases this is the result of some form of obscure sepsis, but some are undoubtedly instances of true hæmophilia. The differential diagnosis is at times exceedingly difficult. J. G. W. Greef³ reports three cases in none of which could a history that would lead to the belief that there was a hereditary tendency be obtained.

Case I. Mother was a primipara, aged twenty-three years, whose family history was good. Labor was uneventful, there being no bleeding on the part of the mother. Five hours after delivery a slight swelling was seen on the child's chest in the right mammillary region, which was diagnosed as a hæmatoma. Twelve hours later the child showed pain on being handled, especially when the joints were touched. The child nursed. On the fifth day after birth a marked icterus appeared, and at the same time large blue and green spots were seen on the chest and face which were considered as hæmatomata. The icterus disappeared in four days and the child improved.

Case II. This was the fourth child the mother had borne and the pregnancy had been normal. The baby was delivered by the breech, but no difficulty was met with. Upon cleansing the mouth after birth a trace of blood was seen on the gauze used, but was considered of no

¹ British Medical Journal, April 27, 1901.

² Münchener med. Wochenschrift, January 7, 1902.

³ Pediatrics, August 15, 1901.

moment. Twenty-four hours after birth diffuse swellings appeared on chest, neck, and shoulders—all parts that had been handled during delivery. At the same time blood appeared from the mouth. A small abrasion was seen on the roof of the mouth, but neither pressure nor chloride of iron could check the oozing. The swellings increased in size and the oozing continued in spite of treatment, and the child died forty-eight hours after birth.

Autopsy showed marked anæmia of the inner organs—heart, lungs, etc. The swellings consisted of extravasated blood that soaked the subcutaneous and muscular tissues. The knee and shoulder joints contained blood. Otherwise the child was normal. Mother's convalescence was uneventful.

Case III. Mother had good history. This, the sixth child, was delivered after a very easy and short labor. Twelve hours after birth a swelling was noticed on the left cheek, which was diagnosed as hæmatoma. The swelling increased in size, the child became very anæmic, and died thirty-nine hours after delivery.

Autopsy showed anæmia of the thoracic organs, the heart being empty except for some fluid blood in the right auricle. The abdominal cavity contained considerable fluid blood; the subcutaneous tissues of the whole body and much of the muscular substance was infiltrated with coagulated blood; the joints also showed a hemorrhagic effusion. Careful microscopical examination revealed nothing that differed from the normal.

In none of these cases could blood be found in the intestinal tract, and effusion of blood in the abdominal cavity is of rare occurrence in *melæna neonatorum*.

The author is certain that his cases were not *melæna neonatorum*, and thinks that the fatal cases of that disease that have been recorded were probably hæmophilia. He thinks that the hæmophilia depends on an abnormal permeability of the vascular walls.

TREATMENT. Little can be obtained from the use of styptics; if the child survive the first attack, measures to strengthen and harden the body and the careful avoidance of injury should be adopted.

METABOLIC DISEASES.

Gout. THE NATURE OF GOUT. There is still much difference of opinion regarding the actual pathology of this disease. That there is some disturbance of uric-acid formation or elimination is admitted by nearly all observers, though it is not certain whether this is the cause rather than the consequence of the disease. The theory of Garrod, that

the symptoms of the disease are produced by an accumulation of uric acid in the blood, attractive as it appeared and tenaciously as it has been retained, still wants confirmation. Accurate metabolic studies have been made in recent years, but thus far the matter is still one in which wide difference of opinion exists. Vogt¹ isolated a patient suffering from gout with a healthy man, and gave the same diet to both, while the study of the metabolism was made on both at the same time. The investigations were divided into three periods :

1. Six days on a diet of 14.58 gm. N and 2.621 P₂O₅ daily.

Healthy man's N output was	16.34 = 1.76 loss.
Gouty man's N output was	13.42 = 1.16 retention.
Healthy man's P ₂ O ₅ output was	3.559 = 0.938 loss.
Gouty man's P ₂ O ₅ output was	3.134 = 0.513 loss.

2. Five days on the diet above plus 175 gm. calves' pancreas = 4.73 gm. N and 2.24 gm. P₂O₅ daily.

Daily intake	= 19.31 gm. N and 4.861 gm. P ₂ O ₅ .
Healthy man's output of N = 17.30	= 2.01 retention of P ₂ O ₅ , 3.996 = 0.865 retention.
Gouty man's output of N = 15.52	= 3.79 retention of P ₂ O ₅ , 3.845 = 1.016 retention.

3. Same as first.

Healthy man's N output = 2.38	loss P ₂ O ₅ output = 1.108 loss.
Gouty man's N output = 0.33	loss P ₂ O ₅ output = 0.535 loss.

In the normal man there was a loss of N in periods 1 and 3 due to little intake, as shown by the figures in period No. 2. In the gouty patient there was always N retention, and during investigation he had a slight attack of gout. Is the N retention in the gouty patient due to albuminous metabolism or to retention of the entire nuclein? In the gouty person, in spite of N retention, the output and intake of P₂O₅ practically balance each other. In the after-period (No. 3) when all the P₂O₅ is excreted some N is retained. Vogt concludes that the nuclein is broken up as in the normal man and the P₂O₅ promptly excreted, while the N remains behind. Is the N retention that of albumin or purin? This is shown by the uric-acid output. At the end of the after-period, when all the P₂O₅ of the gouty patient was excreted, his output of uric acid was less than that of the healthy man. Thus in period No. 1 the healthy man excreted 3.777 gm. of uric acid and the gouty man 3.798 gm., while in period No. 3 the healthy man excreted 3.540 gm. of uric acid and the gouty man 2.822 gm. The author thinks this shows a disturbance in metabolism, whereby the nuclein, in so far as it is absorbed, undergoes a normal breaking up, and the P₂O₅ is promptly excreted, while the uric acid arising from it is de-

¹ Deutsch. Archiv f. klin. Med., Band lxxi., Heft 1.

laid in its excretion. Whether this is due to a diminution in oxidation, or to changes in splitting up, or in synthesis, the author does not know. In comparison with the excretion of P_2O_5 the excretion of N and uric acid in the gouty seems to be lessened. This shows a slowness in the metabolism of the nucleins. The author thinks it doubtful if this be the sole cause of N retention in gout. The views of Ebstein regarding the causation of the lesions in and about the joints are well known. Referring to the matter in his recent work,¹ he states his belief that the uric acid is the causal substance in gout. In the present state of our knowledge we must consider the formation of this acid as closely connected with the destruction of nuclein substances. Under normal circumstances this occurs in no small part in the muscles of the extremities and the marrow of the long bones, both of which are rich in nuclein material. As to the rôle of the xanthin bases, further investigation is required.

Increased formation of uric acid need not be accompanied by increased output, as the acid may undergo changes in the body. The gouty man shows the same variation in the urinary excretion of uric acid as the healthy man.

Increase of uric acid in the blood of the gouty patient has not as yet been certainly demonstrated.

Ebstein explains gout in the following way: The uric acid made in the muscles and bones is carried by the lymph vessels to the blood. When from any of many possible causes the permeability of these vessels is diminished there is a damming back of the uric acid, and it exerts its poisonous action on the tissue. This damming process is the cause of the acute attack. The more frequent occurrence of the gouty deposits in the peripheral parts is explained by their greater exposure to injury.

Whether the attack is acute or chronic depends on the rapidity and completeness with which this damming back occurs.

The gouty deposits are brought about as follows: The passage of the uric acid is interfered with; the dammed-back acid causes a death of the tissue, with a coincident change in its reaction from alkaline to acid, and there follows a crystallization of the uric acid in this spot of, necrosis in the form of sodium urate (biurate).

Stekel² finds in gouty patients a remarkable tendency to low temperature, and to this he attributes the retention of uric acid, with the attendant symptoms. As a means of treatment he advises citrophen, 1 gm., with caffeine, 0.1 gm., combined with warmth, baking, massage, and gymnastics. All treatment he claims is based on this.

¹ Handbuch der prak. Med., 1901.

² Wien. med. Wochenschrift, 11 and 12,

GOUT IN CONNECTION WITH LEAD IMPREGNATION. George Lorrimer¹ finds : 1. That among hospital patients a large proportion of those suffering from gout have previously suffered from lead-poisoning. 2. Patients who are subject to gout are especially susceptible to plumbism, and in those predisposed to gout the latter may be induced by the administration of lead salts. This is shown by the discontinuance of the gout on the withdrawal of the lead and its reappearance on renewed administration. 3. Under the influence of lead salts the blood becomes charged with uric acid, with a corresponding deficiency in the urine. Of 696 cases of true and typical gout, 80, or 11 per cent., had lead-poisoning. Of 772 cases admitted for arthritic disease whose occupation exposed them to lead, one-seventh showed evidences of plumbism.

DRUGS AND OTHER THERAPEUTIC MEASURES IN GOUT. De la Camp² reports the results of metabolism in a case of chlorosis, three cases of gout, and in one case of leukaemia before, during, and after the administration of "quinic acid" combined with urotropin.

This remedy was introduced by Weiss, who claims for it the power of diminishing the output of uric acid and at the same time increasing the hippuric acid. The drug can be given in quantities up to 30 gm. daily without any bad effect. It has been used in various combinations : combined with lithium citrate, as "urosin ;" with piperazine, as "sidonal ;" with urotropin, as "chinotropin."

Chinotropin was used by de la Camp, the maximum dose being 7.5 gm., corresponding to 1.5 gm. of urotropin. (There are two preparations—one containing two molecules of quinic acid, the other four molecules of this acid, and in each case combined with one molecule of urotropin.)

The conclusions arrived at are as follows :

1. The influence of quinic acid on the uric-acid output of gouty and healthy individuals who are on a mixed diet is not a regular one.

2. A marked increase of hippuric acid is always demonstrable.

3. According to the present knowledge, quinic acid is more likely to increase the uric-acid output in those cases where, as in leukaemia, a large amount of uric acid is constantly being excreted or where large quantities of uric-acid-forming food (thymus) is being taken.

4. The relation of the uric-acid formation to that of hippuric acid, their possible change into each other, and the place and nature of this change cannot be explained in human gout, because the rôle of the uric acid is entirely unknown, and the chemical tests and tests on animals cannot be used as a direct explanation of the changes that take place in the human organism.

¹ Quarterly Medical Journal, England, May, 1901.

² "Quinic Acid and Gout," Münchener med. Wochenschrift, 1901, No. 30.

5. Clinical experience speaks in favor of the use of quinic acid in the treatment of gout.

6. The combination with urotropin is to be recommended because the latter is broken up in the human organism, and forms formaldehyde, with which uric acid is said to form readily soluble compounds.

Salfeld¹ reports five cases of gout (acute) successfully treated with a combination of quinic acid and piperazine, under the name of sidonal. He attributes the good results to quinic acid. He gave it in doses of 1 gm. five times daily.

EFFECT OF ALKALINE WATERS ON URIC ACID. Determeyer and Buettner² give the results of their investigations on the use of an alkaline mineral water that belongs to the middle grade of such waters. They determined the quantity of urine, the specific gravity, etc., of two healthy persons and of one patient of a "uric-acid diathesis" before, during, and after the use of the mineral water, as well as the ability of the urine to dissolve uric acid. To do the latter they proceeded as follows: In the twenty-four hours the urine was estimated as to the amount of uric acid. A portion of this urine was taken, and after the addition of an excess of pure uric acid was well shaken, the mixture then filtered, and the quantity of uric acid present in the filtrate again determined. The difference shows the solubility of the urine for uric acid.

The above depends on the fact that when a crystalline body is brought in contact with a saturated solution of the same body it has the power to take the salt from the solution to itself, becoming heavier, while the solution becomes more dilute.

The specific gravity was slightly diminished in all the experiments. The phosphoric acid (determined in one healthy person and in one patient) was diminished in the healthy person and increased in the patient. The uric acid in the four investigations on healthy persons was more or less diminished, while in the patient there was a slight increase. The authors think that this diminution is due to a lack or a decrease in the formation of the uric acid. The increase of the uric-acid output in the patient is due to the flushing of the water, as shown by the return of the uric-acid output to the normal after a few days' use of the water. As to the ability of the urine to dissolve uric acid, they found the same results in all investigations—a decided increase, which was especially marked in the urine of the patient. They conclude: The mineral water acts as a diuretic; the water acts also as a means of diminishing the formation of uric acid; above all, the water gives to the urine the ability to dissolve uric acid. This power of

¹ Münchener med. Wochenschrift, April 16, 1901.

² Deutsch. med. Wochenschrift, 1901, No. 21.

solubility is not dependent solely on the increased dilution of the urine, as the diminution in the specific gravity is proportionately less than the increase in the solvent power. They think the above good results are brought about by an absolute diminution in the amount of the mononatrium phosphates in the urine, together with a change in the relation of the mononatrium to the dinatrium phosphates, in favor of the latter.

Klemperer¹ finds that the free carbonic acid in the urine renders the solution of the free uric acid in the urine most difficult, but, on the contrary, renders the solution of the urates easier. Thus the effort should be made to secure a neutral or nearly neutral reaction of the urine, with a content of carbonic acid. This is done by a mixed diet and the administration of alkaline mineral water containing CO_2 .

Diabetes. **ETIOLOGY.** Notwithstanding the activity of the physiological chemists in the study of diabetes, our knowledge is still decidedly scanty regarding the nature of this disease. That there is some disturbance of carbohydrate metabolism is, of course, almost self-evident; but the nature of this disturbance has been regarded from very different points of view. A recent series of studies into the fate of sugar and the intermediary products of its destruction seems to me most suggestive, though the investigators are far from harmonious in their opinions regarding the significance of these facts. Paul Mayer,² in a paper on "Incomplete Oxidation of Sugar in the Organism," states his belief that while the sugar oxidation may begin normally, at times the process is not carried to its full completion. All of the by-products in the oxidation of the sugar are not known, but glycuronic acid is certainly one of them. From a former article the following conclusions were reached: Glycuronic acid is present in normal urine in small amounts; it is always combined with phenol, indol, or skatol; it is levorotatory (when in combination); free glycuronic acid is dextrorotatory; and it is non-fermentable.

In the instances in which the Trommer test is not typical, delayed, etc., and in which the examiner is unable to say whether sugar is present or not, Mayer thinks glycuronic acid is the reducing agent present which gives rise to the uncertainty.

Method of Demonstration. Fifty c.c. of urine, to which has been added enough sulphuric acid so that the solution represents 1 per cent. of sulphuric acid, is heated in a porcelain dish over a free flame for one to three minutes. This liberates the glycuronic acid from its combination. The "orzin" reaction is then tried, and the characteristic absorption bands in the spectrum are then looked for.

¹ Zeitschrift f. Diät und Physikalisch Therapie, 1901, Band v., Heft 1.

² Deutsch. med. Wochenschrift, Nos. 16 and 17.

In fourteen patients to whom 100 to 200 gm. of sugar had been given he found both sugar and combined glycuronic acid in the urine ; in six cases only the combined glycuronic acid was found.

The oxidation of the sugar into glycuronic acid involves a change of the "primary alcohol group" into the "carboxyl group" without affecting the carbon nucleus of the molecule. Thus both substances may be present together or either alone.

In one case 150 gm. of grape sugar were given. After one and a half hours 0.2 per cent. of sugar was found ; one hour later the urine showed only a minimal dextrorotation, and reduced Fehling's solution atypically. The two portions were combined, and after fermentation there was found a levorotation of 0.4 per cent.

In another case the urine after administration of 200 gm. of grape sugar was optically inactive, yet gave a strong response to Trommer's test and showed a distinct fermentation. After complete fermentation a levorotation of 0.2 per cent. was found.

In still another case after sugar administration the urine showed no sugar, but gave a "delayed" reduction of the copper test ; there was no fermentation, and a more or less marked levorotation was present. All these three varieties of cases permitted an easy demonstration of the glycuronic acid.

Mayer has not been able to isolate the glycuronic acid from the blood. He has found that the solution remaining after separation of the sugar from the blood by fermentation gives a distinct reduction (copper?), the "phlorogluzin" test, and sometimes a weak "orzin" reaction. The solution often shows a distinct levorotation, which he does not think can arise from the albuminous substances. If now this solution is heated with sulphuric acid the levorotation gradually changes to a dextrorotation, and the "orzin" test, formerly weak or even absent, is now marked in every case. This he looks upon as proof that the glycuronic acid is present in the blood in a combined form.

In seventeen cases of fever he was able to demonstrate glycuronic acid five times. He also found the acid in cases in which there was interference with the oxidation processes, as in heart disease with lost compensation, dropsy following insufficiency of the kidneys, mediastinal tumor, and aortic aneurism with marked dyspnœa.

Among thirty cases of diabetes he found an excess of glycuronic acid in eleven. Of special interest were the cases in which as a result of a strict diet the sugar had entirely disappeared from the urine. In these he found the atypical behavior with the copper test, and on further search the glycuronic acid.

The frequency with which oxalic acid is found in diabetes he explains by supposing it to be due to an incomplete oxidation of the

glycuronic acid. The majority of investigators have decided that the oxalic acid is not derived from the carbohydrates (he quotes Mills, Lüthje), because the oxalic-acid excretion was least on a diet that was rich in carbohydrates. Mayer thinks they did not give enough of the carbohydrates. He investigated the oxalic-acid output in two rabbits before, during, and after the administration of 40 gm. of grape-sugar daily. In both cases there was a distinct increase in the amount of oxalic acid excreted, in one case four times the amount found before and after the sugar was given. As proof of the relationship between the glycuronic acid and the oxalic acid, he found that while the largest amount of oxalic acid was excreted there was at the same time, besides sugar, a considerable quantity of glycuronic acid in the urine. He explains the presence of oxalic and glycuronic acids in diabetic urine as follows: When the sugar excretion is marked the greater part of the sugar escapes all oxidation. With an improvement in the condition a part of the sugar previously excreted is oxidized. This oxidation need not go on to the formation of CO_2 and H_2O ; either glycuronic or oxalic acids may be formed and the oxidation proceed no further.

The author thinks he has made it plain that increase in the excretion of glycuronic acid is not an infrequent occurrence, and, like the oxaluria of the diabetic, has its origin in the incomplete oxidation of the sugar. Through the demonstration of an increase in the excretion of glycuronic acid we are in a position to diagnose an impairment of the sugar oxidation at a time when no sugar is excreted in the urine. The author has seen cases in which, without cause, there was an increase in the glycuronic output. These he looks on as preliminary stages of diabetes, and thinks that by proper treatment the disease may be avoided.

Mayer's studies are highly suggestive, and if confirmed would tend to simplify the matter of urine reactions in diabetes, and particularly in those who present a variable reaction, with oftentimes only a discoloration of copper solutions instead of precipitation. Further, these studies would be most important if the claim that the glycuronic acid appears before sugar excretion begins is substantiated. It is highly desirable that some method of early recognition of the onset of diabetes should be developed. It is doubtful, however, if the tests suggested by Mayer will be borne out, as the conditions under which the excretion of this acid takes place in quantities sufficient to give the reaction are numerous. In considering the same subject D. L. Edsall¹ quotes the work of Mayer, and states the main conclusions of Mayer, as follows:

(1) That the close relation of dextrose and glycuronic acid and the conditions under which he has found the latter make it evident that

¹ University of Pennsylvania Medical Bulletin, April, 1902.

glycuronic acid is one of the steps in the normal oxidation of sugar; and (2) since he found glycuronic acid present in a very large proportion of cases in which there was suboxidation, he believes that he has demonstrated definitely that diabetes is due to suboxidation.

Edsall considers that the great importance of Mayer's work lies in his demonstration of the great frequency of its occurrence in the urine and in his easily applied method for its detection, and in showing that paired glycuronic acid (the only form in which it occurs in the urine) is capable of reducing alkaline solutions of copper. This substance therefore explains the anomalous reactions sometimes obtained in testing with Fehling's solution where the presence or absence of sugar cannot be definitely stated. This theory has been advanced by Halliburton and others, but not demonstrated. The phenylhydrazin-bromide test of Neuberg was too complicated for clinical use, and until the "orzin" test of Mayer there was no ready method for showing the presence of glycuronic acid.

The suggestion that Mayer offers, that the increase of the benzoyl esters found by Rosin and von Alfthan in diabetes mellitus, and attributed by them to an increase in the unfermentable carbohydrates, may be due to an increase in the glycuronic compounds, Edsall does not agree with.

Edsall estimated the esters in three cases of diabetes, in none of which reaction for glycuronic acid could be obtained. In all three cases the esters were increased—12.56 gm., 13.43 gm., and 13.88 gm., respectively, in the twenty-four hours. (The normal amount of the esters is certainly not more than 5 gm. daily.) In another case of diabetes in which the sugar had disappeared from the urine, and in which there was a marked reaction for glycuronic acid, the esters only amounted to 3.81 gm. in the twenty-four hours—very much less than in those where no glycuronic acid reaction was found.

Edsall thinks that the statement of Rosin and von Alfthan that the excess of the esters in diabetes is due to the unfermentable carbohydrates is probably true. This is important, since it would prove that diabetes is a disturbance of the entire carbohydrate metabolism, and does not involve the dextrose alone, and is additional testimony that the disease (diabetes) cannot be explained by the presence of a glycolytic ferment or changes in such a ferment.

Mayer found increased glycuronic-acid compounds in diabetes mellitus, typhoid fever, and other infectious diseases, in conditions associated with alimentary glycosuria and severe circulatory disturbances, in a class of cases in which Mayer thought suboxidation was present, and from his work thought he had proved that diabetes is due to suboxidation.

Edsall interprets the excess of the glycuronic compounds in these cases differently. In all of the above conditions an intoxication may be supposed to exist. He has found an excess of glycuronic acid in four out of eight cases of diabetes, in five out of six cases of typhoid, in a number of cases of general sepsis, in severe tonsillitis evidently accompanied by septic intoxication, and in other infectious conditions.

He considers that the increase of the glycuronic compounds in these conditions is an attempt on the part of nature to protect the system from poisoning, as the effect is to secure the excretions of the poisons in a harmless form.

He believes that the occurrence of large quantities of glycuronic acid in the urine may be used as a means of determining the presence of an intoxication that is otherwise suspected. He has found a marked "orzin" reaction in cases of hysteria, neurasthenia, and various neuroses when all evidences of gastro-intestinal disturbance was absent.

He does not believe that the development of diabetes can be anticipated by the finding of glycuronic acid. He thinks, with Fischer, that the glycuronic acid is not formed from oxidation of the dextrose, and then paired, but that the pairing takes place before the dextrose is oxidized, and consequently alterations in the oxidation can have no influence on the amount of glycuronic acid.

A subject somewhat allied to that just considered is the question of the excretion of unfermentable carbohydrates. References have been made in previous volumes of *PROGRESSIVE MEDICINE* to this subject, but it has been placed upon a more practical basis by the investigations of Rosin and von Alfthan. The subject has been investigated in persons in health, in patients suffering with diabetes insipidus, and also in those having diabetes mellitus.

The unfermentable carbohydrates in the urine were estimated by the precipitation of the carbohydrates by benzoyl chloride in the presence of sodium hydrate. The carbohydrates come down after shaking as benzoyl esters, are collected, washed, dried, and weighed. Rosin and von Alfthan found that in a normal individual the total urinary carbohydrates never amounted to more than 5 gm., while the average was about 1.6 gm. In diabetes mellitus they found the unfermentable carbohydrates never less than 9 gm., and in some instances as much as 20 gm. as the daily output. In a preliminary report of a case of diabetes insipidus they think they found the unfermentable carbohydrates increased.

Edsall's¹ patient was recovering from an attack of typhoid fever when the investigations were made. Besides polyuria and thirst he had no other symptoms. Edsall found that the esters were not increased. He

¹ American Journal of the Medical Sciences, May, 1901.

thinks, however, that under normal circumstances in diabetes insipidus the flushing of the body by the passage of so much fluid through it could increase the carbohydrate output in the same manner as the nitrogen output may be increased by the use of large quantities of water.

In Edsall's case the patient was putting on flesh and retaining nitrogen, and he thinks there was a possible retention of carbohydrates at the same time. He found that a diminution in the output of urine was attended by a diminution in the excretion of carbohydrate. The amount of carbohydrate is therefore influenced to a marked degree by the amount of urine passed, and probably also by the diet.

Edsall also estimated the nitrogen, in order to see if there was a relation between the excretion of this and the excretion of the carbohydrates. Such a relation must be present if the suggestion of von Alfthan that the unfermentable carbohydrates are derived from the body proteid be true; that is, if the nitrogen intake remains constant, as it did in Edsall's case. He found that there was not the slightest tendency toward the maintenance of a fixed ratio between the two, and so far as one such observation goes it points against the formation of the urinary carbohydrates in this case from the body protein. The question demands more study.

Von Alfthan's normal case showed marked variation in the daily excretion—from 1.5 gm. to 5.1 gm. The diet was not mentioned. In Edsall's case while taking large amounts of liquid the variation in the esters was only between 2.099 gm. and 2.97 gm. When the fluid was reduced the excretion fell, but the variation was only slight—from 1.768 gm. to 1.268 gm. The diet was constant. Since his patient on a constant diet showed such slight variations, while von Alfthan's showed such marked differences, Edsall thinks it is extremely probable that the amount of carbohydrates in normal urine depends largely on the diet, and that these carbohydrates are, in a large part at least, derived from the food rather than formed in the body. The question requires further investigation. In reference to the benzoyl chloride Edsall found that some specimens were faulty, and advises care in the selection of the compound.

If it can be shown that in diabetes there is a tendency to increase of glycuronic acid and of unfermentable carbohydrates, and that during times of temporary absence of sugar from the urine these other substances may be present in abnormal quantities, a considerable addition will have been made to our knowledge of the clinical course of this malady, and the physician will be placed in possession of a method of determining whether a case of diabetes has been definitely relieved. At the present time it is often a matter of doubt and uncertainty, and treatment is frequently neglected before it ought to be relaxed.

THE PANCREAS AND DIABETES. It needs scarcely to be reported here that the profession has accepted diseases of the pancreas as one of the pathological conditions capable of producing diabetes. The past year has served to specialize the lesions of the pancreas or at least to bring out certain suggestions in this direction that further observation may confirm. The investigations thus far would scarcely warrant a positive expression of opinion regarding relations of the lesions of the islands of Langerhans to diabetes, but they are certainly highly suggestive. The most important paper in this connection is that of E. L. Opie.¹ Under the title of "Islands of Langerhans in Chronic Pancreatitis," the author gives reports of the examinations (microscopical) in seventeen cases. From a histological study of these structures in man and the lower animals, in injected specimens, and in glands stimulated by the administration of pilocarpine he has come to the following conclusions :

1. The islands of Langerhans are composed of cells having the same origin as those of the glandular acini, but forming structures which are independent of the secreting apparatus and in intimate relation with the vascular system.

2. In the splenic end of the cat's pancreas they have a definite position within the lobule, each of which contains one of these structures.

3. In the human pancreas they are more numerous in the splenic extremity or tail than elsewhere. Similar variation in their number is observed in cats and dogs.

4. Prolonged stimulation of the gland does not, as claimed by Lewaschen, transform groups of acini into islands of Langerhans.

His cases examined and reported include :

- (a) Two cases of congenital syphilitic pancreatitis (lived three and four hours after birth). Case I. was considered to be in an active stage of a chronic inflammatory process. In Case II. the process was more advanced and was no longer active.

"A conspicuous feature of both cases was the presence of numerous islands of Langerhans surrounded by newly formed stroma, but not invaded by it."

Chronic Pancreatitis is divided into (a) interlobular and (b) inter-acinar. The interlobular pancreatitis is again divided into two classes—those produced by duct obstruction and those in any other manner. Of the interlobular pancreatitis not due to obstruction he speaks of six cases. In these, even though the sclerotic tissue between the lobules was increased so that the glandular acini were in a condition of marked degenerative change, the islands of Langerhans remained intact—due,

¹ Journal of Experimental Medicine, January 15, 1901, vol. v.

the author believes, to (1) the vascular supply being richer than the adjacent acini; (2) since the ducts do not penetrate them they are less exposed to the action of irritants which reach the gland by way of the duct. Interlobular pancreatitis due to duct obstruction—three cases. Here the sclerosis was marked, but the islands were apparently intact. The author thinks that long-continued sclerosis from pressure would interfere with nutrition of the islands. All the above show a marked definition of the normally rather obscure lobulation of the pancreas.

Chronic Interacinar Pancreatitis. In this the lobulation was obscured by masses and strands of connective tissue within the lobules. The condition is more infrequent than the interlobular form. Three cases (one case associated with “hæmochromatosis”).

Cases I. and II. Both had polyuria and sugar in the urine. In both the islands were involved, surrounded by a thickened connective-tissue capsule, and showing ingrowths along the capillaries of sclerotic tissue. There seemed to be more connective-tissue growth near the islands than elsewhere. Thus in this form of chronic pancreatitis the islands are involved comparatively early in the process, in contrast to the condition found in the interlobular variety. In the case associated with “hæmochromatosis” the patient died of typhoid fever. No glycosuria was present. The new-found fibrous tissue bears no constant relation to the lobules. The alterations of the islands associated with the deposition of hæmosiderin in the parenchymatous cells was as follows: 1. Pigment was abundant in the cells, and tended to accumulate in that part most distant from the capillaries. 2. The cells undergo fatty degeneration. The island was embedded in a capsule-like mass of fibrous tissue containing pigment granules.

Hyaline Degeneration of the Pancreas. He reports one case, a girl, aged seventeen years, who died in diabetic coma. Throughout the organ were round or oval hyaline areas embedded in the parenchyma. On staining by hæmatoxylin these bodies stood out as almost unstained columns, tortuous and hyaline, between which were compressed lines of cells, apparently parenchymatous in origin. Areas stained brightly by eosin. The hyaline material did not stain by Weigert's method for fibrin. Reactions for amyloid were not obtained from the specimens hardened in alcohol. With phosphomolybdic acid hæmatoxylin the hyaline material takes a peculiar bright blue, in contrast to the deep blue-black of the fibrous tissue. In general the parenchyma was not changed. The cells were smaller than usual, and were found to contain numerous fat-drops (hardened in Flemming's solution). The interstitial tissue was not, as a rule, increased, and islands of Langerhans of normal construction were not found. The bloodvessels outside of the hyaline area showed no change. The liver was normal, there

was no increase of interstitial tissue, and the bloodvessels were normal. The kidneys showed no change except a small collection of lymphoid cells at one point.

Conclusions and Summary. 1. Congenital syphilitic pancreatitis retards the development of the glandular acini, but does not affect the islands of Langerhans. Embedded in the stroma, but not invaded by it, the latter maintain their continuity with the small ducts and acini, with which they have a common origin.

2. Two types of chronic interstitial inflammation affecting the developed pancreas are distinguishable :

(a) *Interlobular Pancreatitis.* In the interlobular variety the inflammatory process is localized chiefly at the periphery of the lobule, and implicates the islands of Langerhans only when the sclerotic process has reached a very advanced grade. When advanced pancreatitis has followed the obstruction of the ducts the islands long remain unaltered, though embedded in dense, scar-like tissue.

(b) *Interacinar Pancreatitis.* In this type the process is diffuse, invading the lobules and separating individual acini. The inflammatory change invades the islands of Langerhans.

3. A relation has been observed between the lesions of the islands of Langerhans and the occurrence of diabetes mellitus.

(a) In one of eleven cases of interlobular pancreatitis diabetes of mild intensity occurred. The sclerosis, which in this case followed obstruction of the ducts by calculi, was far advanced, and affected the islands of Langerhans.

(b) In two of three cases of interacinar pancreatitis diabetes was present. The third case was associated with a condition—"haemochromatosis"—which at a later stage is associated with diabetes, the result of pancreatic lesion. In a fourth case of diabetes mellitus hyaline deposition between the capillaries and the parenchymatous cells had so completely altered the islands of Langerhans that they were no longer recognizable.

Later, Opie¹ reports the pancreas in another case of diabetes. Here he found all the islands involved in the hyaline change. The hyaline substance at times lies in the midst of groups of cells, but is usually in contact with the walls of the capillaries penetrating the island or next the peripheral fibrous tissue, and is therefore usually between the remaining cell and the capillary walls. Increasing in amount, it replaces the cells, and where it is abundant the cells which still persist are small and contain small nuclei that stain deeply with hæmatoxylin. The hyaline substance may occupy almost the entire area of the island.

¹ Journal of Experimental Medicine, January 15, 1901, vol. v.

The nuclei of the capillary endothelium persist after destruction of the epithelial cells, but they in turn disappear. The lumen of the capillary remains patent, and red blood cells are seen between the hyaline masses, although the endothelium no longer contains nuclei. The hyaline metamorphosis is limited strictly to the islands of Langerhans, the glandular acini remaining intact. No lesions similar to those in the pancreas were found in any of the other organs.

These studies, while not entirely accurate, are at least highly suggestive. In one case of diabetes J. D. Steele¹ reported a diminution in the islands of Langerhans; and Hertzog² reported two cases, giving, in addition, a complete bibliography of cases to the present date. These cases are as follows:

Dickhoff, 1894	1
Szobolow, 1900	2
Opie, 1901	5
Weichselbaum	18
Hertzog	2
Steele	1
Total	<hr/> 29

To these, however, should be added the cases reported by Wright and Joslin.³ These authors examined microscopical sections from the pancreas in nine cases of diabetes, and found hyaline changes in the islands of Langerhans in two out of nine cases. "The appearances and relations of the hyaline material as well as the finding of a few epithelial cells whose cytoplasm is hyaline and stains with eosin suggest that it (the hyaline material) is produced by a transformation of the epithelial cells."

The most comprehensive study up to the present time is that of Weichselbaum and Stangl.⁴ They give a résumé of conditions hitherto thought to be characteristic of the pancreas in diabetes:

1. Naunyn found an atrophy, either primary or secondary. The atrophy due to stone in the duct was the most frequent.

2. Hanseman found out of forty cases simple atrophy in thirty-six. He thinks that there is a specific granular atrophy that from the beginning is connected with a diminution in the function of the parenchymatous cells.

3. Lemoine and Lannois look on the frequent occurrence of sclerosis of the pancreatic vessels as causal, in that by this change the passage of a glycolytic ferment in the blood is hindered.

¹ Philadelphia County Medical Society, November 21, 1901.

² Chicago Pathological Society, November 1, 1901.

³ Journal of Medical Research, November, 1901.

⁴ Wien. klin. Wochenschrift, 1901.

4. Hoppe-Seyler thought that the vascular change produced nutritive disturbances in the areas supplied by these vessels, thus leading to thickening of the connective tissue and degeneration and disappearance of the gland cells.

5. Dickhoff (Leipzig, 1894) remarked on the changes found in the islands of Langerhans in diabetes, but was not convinced as to their relation to the disease, though in one case he says they were smaller and in another case absent.

6. Szobolow (1900) reported two cases in which the islands of Langerhans could not be found.

7. Opie. As above.

Weichselbaum and Stangl report the findings in 18 cases of diabetes ranging in age from fourteen to seventy-five years, with a duration of the disease from three weeks to nineteen years. Nearly all died in coma. They compared their results with examinations made on individuals of different ages, both diseased and healthy (suicides and executed criminals), but the number of such examinations is not given. They found that the pancreas was diminished in size in 17 of the cases; the remaining case was normal. The diminution was chiefly in breadth and thickness. Macroscopically all but 2 of the specimens appeared normal. Of the cases showing changes one was fatty and the other showed induration. Microscopically 7 cases showed that the interlobular and the intralobular connective tissue had been changed into fat tissue. In 2 cases there was general obesity at the same time, while in 10 cases the interstitial tissue contained isolated fat cells. In only 1 case was there a marked increase in the interstitial (particularly intralobular) tissue. This was, properly speaking, induration after pancreatitis. The tissue was poor in cells. In 3 cases they found small collections of mononuclear round cells, not closely set, and in 1 case (following an amputation for gangrene) there were, in addition to the round cells, some polynuclear cells; 1 case showed, besides, fat necrosis. The bloodvessels were sclerotic in 7 cases, these cases all being over fifty years of age. In the young diabetics no such arterial change was found.

The islands of Langerhans were found diminished in number both relatively and absolutely. This diminution was determined by comparison with sections taken from other organs, both healthy and diseased, bearing in mind the statement of Opie that there is an unequal distribution of these bodies. The comparison was made especially between diabetic cases and cases of atrophic pancreas without diabetes—such atrophies as are produced by marasmus from senility or disease, and after syphilitic and non-syphilitic pancreatitis. In none of these conditions was the diminution so marked as in diabetes.

In connection with their conclusions, however, it must be noted that while they found marked changes in the islands of Langerhans in diabetes, these changes are relative rather than absolute, since atrophy of the islands occurs in non-diabetic pancreatitis as well as in the diabetic cases. In a more recent discussion Schmidt¹ reports the condition of the pancreas in 23 cases of diabetes. In 8 of these cases the pancreas showed no change from the normal. The simple atrophy of the pancreas, with or without lipomatosis, he does not consider as causal in diabetes so long as no changes from the normal are present. Only 1 case of simple atrophy was found in his series. He comments on the frequency with which small areas of round-cell infiltration are found in the pancreas both in diabetics and non-diabetics, especially the former. In 7 of his cases such a condition was present, but the functioning power of the parenchyma was so little diminished that this slight change could not be looked upon as a causal factor in the diabetes. The sugar excretion had existed so long that these inflammatory changes must be looked upon as secondary irritative processes. In 1 case he found in an atrophic but otherwise unchanged pancreas hyaline degeneration of the islands of Langerhans similar to the case described by Opie.

In 1 case (a boy, aged ten years) he found an almost isolated, acute interstitial inflammation of the islands. The round-cell infiltration occurred almost entirely in the peripheral part of the islands, and rarely were areas found in the parenchyma. In some instances the vessels of the islands were surrounded by a sheath of connective tissue that might be considered as evidence of chronic inflammation. As to the significance of this inflammation in causing the diabetes the author is not certain, as he did not know how long the diabetes had existed.

Two of his cases were of the intralobular type described by Opie. One case, following stoppage of the duct, was so completely changed to fibrous tissue as to allow no decision as to the condition of the islands.

In the remaining 2 cases—1 as the result of stoppage of the duct by a stone, the other a spontaneously developed chronic pancreatitis—the islands were found to be increased. This increase of the islands is more than can be accounted for by the relative increase produced by atrophy of the gland bringing the islands close together.

The islands were not only increased in number, but also in size, while the epithelium was entirely normal in appearance. The author thinks the increase arises from the building of new islands from the gland acini. He has seen the same transformation in marked senile atrophy of the pancreas where there was no sugar excretion.

¹ Münchener med. Wochenschrift, January 14, 1902.

Whether these newly formed islands are capable of performing the function of the normal islands is as yet unknown, consequently the findings in these cases of chronic pancreatitis cannot be used in answering the question as to the relation the islands bear to the causation of diabetes. From these observations and from the fewness of the cases reported the author is not prepared to say just what the significance of the islands is in the combustion of sugar.

The most important cases, it seem to me, in the discussion of the relation of the islands to diabetes, are the cases in which the only lesions discovered are in the islands themselves, like one of the cases (that of the boy aged ten years) reported by Schmidt. In the cases of diffuse pancreatitis in which the whole gland is altered, including the islands of Langerhans, no conclusions are justified.

NERVOUS SYSTEM AND DIABETES. Flexner,¹ after considering the various theories of this disease, says: The symptom-complex of diabetes is dependent upon no one primary set of functional and anatomical conditions. Glycosuria follows so many insults to the body that its significance is minimal.

Flexner and Pearce have seen glycosuria fifteen minutes after the injection of gastric juice into the duct of Wirsung in a dog. Such sudden glycosurias have, in not a few instances, especially after injury to the central nervous system, either persisted, with the production of diabetes, or, after an interval of absence, have been followed by that condition.

The organs which would appear to be established as presiding over the carbohydrate metabolism are the pancreas and the liver. The mechanism of this control has not been solved.

That nervous influence is essential is proven both by experiment and observation of pathological states in man, but that the nervous control is specific and other than the ordinary trophic influence is highly improbable.

The carbohydrate control resides in certain somatic cells contained in the pancreas and liver, chiefly in the former organ and perhaps in still other organs, or the integrity of these cells insures physiological metabolism. Pathological conditions, perhaps only functional, but certainly organic, and not always demonstrable by our present means of study, disturb the control, whence arise, according to the circumstances of duration, severity, etc., transient glycosuria or persistent diabetes.

The influence of the nervous system on diabetes to which Flexner refers was made the principal theme in the discussion of W. H. Dickinson² in the Baillie Lectures. He holds that while an infrequent form

¹ University of Pennsylvania Medical Bulletin, January, 1902.

² Lancet, 1901.

of diabetes is produced by disease of the pancreas, the ordinary form has its organic seat in the nervous system. The actual change has not as yet been determined. The most frequent pathological condition found in diabetes is the extravasation of blood in the perivascular canals of the brain. These are not the result of rupture, but of transudation. They have no necessary connection with coma; they are not limited to any special part, and usually surround the deeper arteries, and may possibly imply an increase of the pressure.

In twenty-two diabetic brains this change is found in eight. In studying the spinal cord in diabetes Dickinson found in two of eight cases that the central canal was dilated, while in a third case the canal presented a puckered appearance, as though the primary dilatation had been followed by shrinking. He also noted a hyaline change in the lateral horns, but thinks this may be due to post-mortem changes.

The liver was large, red, and congested. The vessels were full of blood, and he has published a case in which ante-mortem coagulation had occurred.

Among the causes he mentions grief, anxiety, terror, alcohol, heredity, and gout. The two most prominent causes are heredity and mental impressions.

Of the clinical symptoms related to the nervous system he mentions the loss of the knee-jerk, which is an early and frequent symptom of diabetes. This must arise from some change in the cord or nerves. While peripheral neuritis is looked upon as a result of diabetic toxæmia, and may cause the loss of the knee-jerk, both may be due to cord changes. Another point of relation to the nervous system consists in the increase in the output of the earthy phosphates. This increase he thinks may be due to the condition of the nervous system.

The peculiar dusky redness of the skin, which may be explained by a vasomotor palsy, the hyperæmia of the mucous membranes, and, finally, the appearance of sugar in the urine of a fair proportion of the occupants of the insane asylums, all speak for the nervous origin of the disease.

The relationship of the nervous system—especially of certain etiological factors, such as shock, grief, and the like—to diabetes has long been recognized, though it has perhaps been less emphasized of late than the importance of the subject would warrant. In this connection perhaps the case reported by McNaughton¹ might be alluded to, though the possible lesion of the brain was excluded by the report. The case was that of a child, aged five years, who died of diabetic coma. The child was first seen on January 1, 1901. Four weeks before it was noticed that the child was losing flesh. Three weeks before the

¹ *Lancet*, March 9, 1901.

thirst was first observed. The urine at the time of observation contained 3 per cent. of albumin and 6 per cent. of sugar. On the 22d the child, after vomiting several times, became dyspnoic, the extremities became cyanosed, coma appeared, and death occurred on the morning of the 23d. No autopsy was allowed. There was a history of a discharge from the ears about three weeks before the patient was seen, but the author thinks that a brain lesion could be excluded.

Ellinger and Seelig¹ refer to the influence of injury to the kidneys in the course of pancreatic diabetes in dogs. They found that dogs from which the excretion of sugar was constant after injection of cantharides showed a diminution in the output of sugar. In one case after injection of the cantharides the sugar percentage fell from 7.6 to 2 per cent. The effect of the cantharides was but transient, and they were unable to select the proper time in which to make the estimation of the blood sugar. They noted, however, that in the animals with peritonitis there was a diminution in the sugar output, and in each case were able to demonstrate a kidney lesion. At the same time they were able to demonstrate that the sugar content of the blood was markedly elevated. They think that their results prove that the kidney disease led to a diminution in the sugar excretion, while the hyperglycæmia still existed. They do not think that this increase in the blood content of the sugar was due to the fact that the blood was taken from the animals shortly before death and that the increase was due to a loss of oxidizing power on the part of the tissues, as the condition was not found in other dogs suffering from like conditions, but with the kidneys uninjured. They quote the work of Schupfer, who found by a one-sided kidney lesion that the injured kidney excreted albumin and much less sugar than the uninjured kidney.

The authors think that the theory of increased tolerance of the cachectic to carbohydrates as well as the disappearance of sugar from the urine in such conditions may be due to a kidney lesion. Under these conditions they think that great attention should be paid to the urine examination for albumin and casts, and that the sugar content of the blood should be determined in order to see that there is not a heaping up of the sugar in the blood.

They quote Kuelz as always finding a number of casts in the urine at the beginning of diabetic coma. The authors think that one may assume a heaping up of the sugar and other substances in the blood that may be of significance in the production of the coma.

SUPRARENAL DIABETES. Several recent observers have called attention to the fact that the ingestion of suprarenal extract or the hypo-

¹ Verhandlungen des Congresses f. innere Medicin, Berlin, April 16 to 19, 1901.

dermic introduction of this substance produces glycosuria. Attention was first definitely called to this by F. Blum.¹ He used suprarenals from sheep, calves, dogs, and in one case from man. The aqueous extract was sterilized (1) by filtration through a porcelain filter (Reichel's "Thonfilter"); (2) by heating the extract to a temperature between 65° and 70° C. for ten minutes on three successive days and filtering off the coagulated albumin; (3) by primary coagulation and removal of the albumin and exposure of the liquid remainder to a temperature of 90° to 95° C. for a short time on two successive days. The extract in each case gave the specific suprarenal reaction; that is, a green color on addition of chloride of iron and reduction of an ammoniated silver nitrate solution. The extracts in each case were found to be sterile. The specimens not subjected to heat were most active in producing glycosuria. He made the injections subcutaneously, so as to avoid the marked increase of blood-pressure which is caused by the intravenous injections. Feeding with suprarenals gave no results excepting gastric irritation when the dose was large. In twenty-two cases he found sugar after the above injections. This sugar appeared when there was no carbohydrate in the diet, and in one instance in a dog which had fasted for nineteen days and in which he assumed that the glycogen had probably all disappeared from the liver. He states that all mammals are susceptible to this glycosuria-producing substance in the suprarenal.

He believes that the theory of a suprarenal diabetes is tenable, and he says that "the glycosuria is apparently produced by a toxic action on one or more organs concerned in carbohydrate metabolism." The effect on blood-pressure of the extract bears no relation to the glycosuria, as the blood-pressure effect has disappeared before the glycosuria is apparent. As to the organ affected he makes no statement. The appearance of bile coloring-matter in the urine of some of the animals points to the liver as being the affected organ, though this may be only an accompanying action of the extract on the liver. He was unable to find any connection between the bile-pigments and the amount of sugar excreted. The appearance of this bile-pigment was only seldom. Albumin was present occasionally as a trace.

Aceton and diacetic acid were not found. β -oxybutyric acid he did not demonstrate. The site of injections showed certain peculiar changes—often an infection produced by the scratching of the animal; but he thinks that the extract may have produced a necrosis.

As to the relation of the suprarenals to diabetes in man, he is of the opinion that the glands have as their function the removal of toxic substances from the body. When the gland entirely fails to do this we

¹ Deutsch. Archiv f. klin. Med., Band lxxi., Heft 2 and 3.

have Addison's disease; when the substances are partially changed, but not rendered entirely harmless, we have diabetes.

There can be no doubt of the accuracy of the observation that glycosuria is easily produced in animals and man by injections of suprarenal products; but it does not follow that the term suprarenal diabetes is justified. Systematic writers have uniformly insisted upon a distinction between temporary excretion of sugar and diabetes, and thus far no evidence has been adduced that the effect of experimental injections of suprarenal substances are more than temporary or that disorders of the suprarenal gland cause a diabetic condition by constant discharge of secretion. The subject is, however, one of very great interest and requires careful investigation. Several confirmatory reports have appeared since Blum's paper was published.

G. Zuelzer¹ confirms the report made by Blum as to the production of glycosuria in animals by the subcutaneous injection of suprarenal extract. He experimented on five dogs, five rabbits, and four cats, and in all the glycosuria was produced.

The glycosuria lasted from twenty-four to forty-eight hours after injection, was produced in animals whose food contained no carbohydrates, and could be produced by renewed injection.

The skin over the site of injection lost the hair, became thickened and scaly, or felt tanned. This did not occur in all cases.

He found, besides glucose, rarely albumin, rather frequently albumoses, and very rarely a ferric chloride reaction. Acetone and bile-pigments were not found at all.

That the blood contains more sugar after injection he proved by extirpating the kidneys, determining the sugar content of blood, and then injecting the suprarenal extract. In two of three cases there was increase of sugar in the blood. In a third case the failure was probably due to excessive loss of blood from the operation. This, he thinks, proves that the kidneys are not at fault in the glycosuria of suprarenal injection. He found that at times levulose fed to the animals after an injection appeared in the urine.

Grape-sugar was excreted up to 25 per cent. of the amount fed.

Milk-sugar frequently could be demonstrated in the urine after feeding.

An interesting observation was made on two cats which during a period of four weeks received injections of the suprarenal. A well-marked dark-brown pigmentation appeared on the lips and nose as well as on the mucous membrane of the mouth. This disappeared after six weeks, during which time no injections were given.

¹ Berliner klin. Wochenschrift, 1901, No. 48.

A. C. Croftan¹ states that his attention was directed to the suprarenals as a causal factor for the following reasons: 1. A certain number of cases of suprarenal disease are on record in which diabetes developed. 2. Certain pigmentary anomalies are common to both diabetes ("bronzed diabetes") and to Addison's disease. 3. The author claims to have shown that an intimate relation exists between the formation of the so-called bile-pigments (and their congeners, the pathological pigments) and the destruction of the physiological sugars.

The author has produced glycosuria in animals by the injection of suprarenal extract. He obtained a more marked glycosuria when an unsterilized extract was used, though both produced the condition.

The animals injected were four rabbits and two dogs. In all cases glucose appeared in the urine. Five of the six had slight albuminuria; all recovered. In the urine of both dogs bile-pigment was found, and there was some discoloration around the point of injection.

A number of the author's conclusions are based upon views not as yet established. Far more extensive observation will be required to make the matter clear. In the investigations of Herter and Richards it is shown that ferments have little to do with the occurrence of the glycosuria if the ordinary definition of a ferment is accepted, and in my own clinical and experimental observations I have come to the same result. Solutions of adrenalin heated to temperatures destructive to ferments are still capable of causing glycosuria.

The authors referred to have used watery solutions of extracts of the suprarenal gland. Recently, among other products, a crystalline substance has been prepared by Takamine to which he has given the name *adrenalin*. The compound is in the form of a chloride, and is supposed to represent the blood-pressure raising constituent of the suprarenal gland and perhaps other activities of the gland. It was this substance with which the experiments of Herter were made. Herter and Richards² reach the following conclusions in regard to this question:

1. Adrenalin given intraperitoneally is capable of producing a marked glycosuria, in which the percentage of sugar may reach 9.17 per cent and the ratio of nitrogen and dextrose 4.98. (See Case V.)

2. Adrenalin glycosuria is not dependent on the presence of a diastatic ferment stored or formed by the suprarenal gland.³

3. Adrenalin (intraperitoneally) injections are sometimes followed by destructive lesions of the gastro-intestinal tract and pancreas.

¹ American Medicine, January 18, 1902.

² Medical News, February 1, 1902.

³ See Case IV., in which the solution was boiled five minutes before using, besides the method of Takamine, Journal of American Medical Association, January 18, 1902, requires that the suprarenal glands in the preparation of adrenalin be exposed to a temperature of 90° to 95° C. for one hour.

4. After a fatal dose of adrenalin the cells composing the islands of Langerhans were found to be the seat of granular degeneration, very pronounced in some places. The nuclei of many of these cells showed extensive loss of chromatin substance. In some parts of the pancreas the cells of the islands of Langerhans were much more injured than the surrounding cells of the secreting acini. Herter found intraperitoneal injections in comparatively small doses fatal. The reason for this is not yet entirely clear.

5. With equal doses of adrenalin the intraperitoneal injection proved much more efficient in the production of glycosuria than injections under the skin.

As to the theory that the glycosuria from suprarenal injection is due to the action of a ferment the authors say: It may be pointed out that adrenalin can be added to a solution of glycogen and kept in an incubator for twenty-four hours without any conversion of the glycogen into sugar. These considerations show that there is no reason for attributing the glycosuria from adrenalin to the presence of a diastatic ferment. There is also no ground for referring to a diastatic ferment in the suprarenal body the glycosuria caused by any extract of the gland.

ACID INTOXICATION AND DIABETIC COMA. The relation of certain acids and of various acids in combination to diabetic coma seems to be growing clearer. The opinion of most authors now inclines toward the recognition of acidosis rather than the presence of any special acid as the cause of the condition leading into coma. Various methods have been suggested for determining the different acids and for estimating by indirect means the degree of acid intoxication. The most important paper in this connection is that of Magnus-Levy.¹ The author reports a case of diabetic coma in a girl, aged twelve years, treated successfully by large doses of sodium bicarbonate by the mouth. In the five days preceding the coma, under gradually increasing doses of the soda, the acid excretion increased from 28.5 gm. to 47.8 gm. The soda given amounted to 18 gm. daily. The nitrogen taken in daily varied from 12.8 gm. to 16.3 gm. The "N" output varied between 11.7 gm. and 14.2 gm. The " NH_3 " output varied between 2.80 gm. and 3.16 gm. Quantity of urine, between 1800 c.c. and 2750 c.c.

During two days of coma:

Soda given about	.	.	.	.	109	gm. and 102	gm. respectively.
Total acid output	.	.	.	.	93.3	" "	107.6 " "
Nitrogen intake	.	.	.	.	19.2	" "	22.6 " "
Nitrogen output	.	.	.	.	16.5	" "	21.4 " "
Ammonia output	.	.	.	.	2.98	" "	1.54 " "
Urine output	.	.	.	.	6000	c.c.	7100 c.c. "

The sugar excretion was constantly greater than the KOH intake.

¹ Archiv f. exper. Path. u. Pharmakol., Band xlv., Heft 5 und 6.

During the five days following the coma :

Soda given averaged about	.	.	36	gm. daily.
Acid output varied between	.	.	57	and 53.9 gm.
Nitrogen intake varied between	.	.	24	" 20 "
Nitrogen output varied between	.	.	16.4	" 20.7 "
Ammonia output varied between	.	.	1.90	" 2.85 "
Urine output varied between	.	.	4000 c.c	" 3600 c.c.

Previous to the first coma day the urine was acid in reaction, on the second coma day it became alkaline, and was neutral during the rest of the examinations.

The author thinks that all cases of "severe" diabetes will show the presence of oxybutyric acid in the urine, while in the "clinically mild" cases he never met with it. The absorptive powers of the intestinal tract he found practically normal. Both the nitrogen and the fat were normally absorbed, and the large doses of soda were absorbed within $\frac{1}{2}$ per cent. of the amount given. (Under "total acid output" is included the diacetic acid and oxybutyric acid.)

A survey of the table shows a gradual increase in the acid excretion under the influence of increasing doses of soda before the coma period. Thus between the 19th and 21st of February the oxybutyric acid amounted to an average of 34 gm. In coma the oxybutyric acid increased to 79 gm. and 81 gm. At the same time the acetone increased from an average of 5 gm. before coma to 7.9 gm. and 15 gm. during the coma. Only the smallest part of this was present as pre-formed acetone, and the amount of acetone found corresponds more properly to 13.9 gm. and 26.4 gm. of diacetic acid.

The entire acid output thus amounted to 93 gm. and 108 gm. on the two days of coma—equal to 4 to 4.5 gm. of acid per kilo of body-weight excreted daily. (The child weighed 24 kilos.)

The marked destruction of albumin said to precede or accompany the coma he has been unable to find in the majority of his cases. The present one also fails to show it.

The nitrogen intake was (1) before the coma about 13 gm. to 16 gm. of N; (2) during the coma, 19.1 gm. to 22.6 gm. of N; (3) after the coma, 20 gm. to 24 gm. The N output in the urine in (1) was 11 gm. to 14 gm. of N; (2) 16.5 gm. to 21.4 gm.; (3) 16.4 gm. to 21.7 gm.; this was somewhat behind the intake. From the feces came 1.26 gm. to 1.1 gm. daily. Although the N value of the intake is estimated, and therefore not absolutely exact, at the same time it with certainty allows the exclusion of a marked "eiweisszerfall" as a cause, accompaniment, or consequence of the coma in this case.

The author has reached just the same conclusion as others, namely, that the acids of diabetic-acid intoxication are not the product especially

of proteid decomposition. Later in his paper, as will be pointed out, he discusses other possible sources of acids. Attention should also be called in this connection to the studies of the nitrogen metabolism in the case of diabetes reported by Joslin.

Magnus-Levy found the excretion of sugar previous to the coma varied between 86 gm. and 126 gm. On the two coma days it was 231 gm. and 284 gm.; during the five days following the coma it varied between 207 gm. and 156 gm. The marked increase in the sugar excretion on the days of coma he attributes to the large amount of milk taken—8 litres in the two days, equal to 400 gm. of milk-sugar, equal to 420 gm. of grape-sugar.

Referring to the constancy of the presence of oxybutyric acid in the urine, the author quotes twenty-nine cases, fourteen of which have been previously published and fifteen of which are reported in the present paper. Of the latter group four cases had coma, seven were severe in type, and the remaining four moderate in severity. The last-named were cases in which prolonged withdrawal of carbohydrates had developed a reduced tolerance for this class of food. In these cases only a small amount of oxybutyric acid was found, and with continued improvement in the condition of the patient and with better tolerance for carbohydrates the acid entirely disappeared and failed to make its appearance when soda was administered. He finds that the oxybutyric acid in rare instances decreases spontaneously, even when the patient's life is irregular and the disease is severe in type and accompanied by large excretion of sugar, but without special loss of weight. One case of this character came under his observation.

The regularity of the appearance of the acid is not attributable to the soda administered in his last group of fifteen cases, since it was equally frequent in the fourteen previous cases, in the majority of which no soda was used. In the cases of diabetes of "mild" type he has never found oxybutyric acid.

It has been asserted that oxybutyric acid is constantly present in severe cases, such as always show a considerable increase in the ammonia excretion and a distinct ferric chloride reaction, and in which withdrawal of carbohydrates does not cause a rapid disappearance of sugar from the urine. This view is confirmed by the author.

Referring to the relations of the intestinal tract and its absorptive power to diabetic coma, the author quotes the statement of von Schmitz, who has laid much stress on the value of large liquid movements in the treatment of diabetic coma. Sometimes such movements occur spontaneously, and whether they appear in this way or are induced by medication seems to be helpful. The author does not deny the possibility, but does not believe such movements are essential to the coma.

In several of his cases no intestinal disturbance was detected. The intestinal absorption in these cases was within normal limits.

In discussing the nature of diabetic coma and the probability of its being an acid intoxication he considers the question of whether the increase in acid excretion in his case was the consequence of the administration of soda, or, on the other hand, a primary and essential manifestation of the coma.

In health, by mixed diet, soda up to 80 gm. daily gives little or no increase of the organic acids in the urine. The urine on comparatively small doses becomes neutral or alkaline through the transformation of the monophosphate into the diphosphate of soda and through excretion of the soda bicarbonate. The change in the reaction of the urine affords a measure of the maximum amount of acid that escapes combustion in the organism and can appear in the urine. When the urine becomes neutral or alkaline it shows that the soda cannot find enough acid in the body to replace its carbonic acid. This condition was reached in the case of the child reported, by the administration of 50 gm. of soda daily. Under this the urine was first neutral, then alkaline, and in it there appeared 60 gm. of acid—therefore the maximum that the child could produce outside of coma. In coma, however, in spite of 100 gm. of soda given, the urine remained acid, and the 93 gm. of acid excreted was consequently below the possible maximum. On the following day the maximum—108 gm. of acid—appeared in the urine, which became alkaline. Thus the urine examination shows that the amount of acid excretion is not only a factor of the “*ausschwemmung*” of the soda, but, above all, depends on the amount of oxybutyric acid formed, and that the extreme limit of this depends on circumstances within the body. In coma more acid is produced and, under favorable circumstances (sufficient administration of soda), excreted by the same individual than outside the coma. He compares the amount of acids actually found with the amount calculated from the excess of bases. These amounts tally fairly well. From his work he concludes :

1. The excess of the basal equivalent up to 70 to 80 per cent. is saturated by the oxybutyric acid, and up to 80 to 100 per cent. by the oxybutyric and diacetic acids, so there remains no equivalent for the other acids.

2. That the amount of excreted oxybutyric acid (except in coma and with excessive doses of soda) does not and cannot reach the amount that has previously been found by “*levorotation*.”

The increase in acetone excretion from taking soda bicarbonate has been demonstrated by Weintraud and Mayer. The explanation is to be sought in the “*ausschwemmenden*” action of the soda. The author quotes Arnold as saying that only in very marked cases of diaceturia is

acetone found pre-formed in the urine, and the substance in "native" urine giving the acetone reaction is diacetic acid.¹ The author does not think that the soda acts very strongly by increasing the oxidation, as the result of its administration is an increase in the less completely oxidized acids. The diacetic acid may be looked upon as an expression of increased oxidation, since it originates through oxidation of the oxybutyric acid. In most cases there is at the same time an increase in the unoxidized oxybutyric acid. In case of slight "acidosis" under the administration of soda there may be an increase of the diacetic acid without an increase of the oxybutyric acid. The question of explanation as to the excretion of the acetone cannot be decided. Its output is subject to great variations without apparent cause. Thus under similar doses of soda it may vary from 2.5 gm. to 10 gm.

The Effect of the Administration of Alkalies when Coma is not Present. The increase of the acid excretion in coma following large doses of soda he holds as proved by this in his earlier article. This increase is shown by the fact that in spite of the alkali taken, the urine remains acid in reaction. The same increase of acid excretion is found in severe diabetes after the administration of large doses of soda outside of coma. As before, the persistence of the acid urinary reaction is proof. Under these circumstances, the NH_3 excretion diminishes, being replaced by the soda. Only a part of the soda is so used, the majority appears as neutral salts in the urine, combined with other acids.

The author thinks he has proved the impossibility of the origin of the oxybutyric acid from albumin alone through a direct breaking down of this substance. He does not deny that in case of probable synthesis of the acid out of bodies containing 2 and 3 atoms of C. a portion of the necessary materials could be furnished by the albumin. This is a different idea than what was formerly understood by the generally accepted statement of the origin of acetone, etc., out of albumin.

The author finally considers the probable origin of acetone, acids, etc., from fats containing many carbon atoms or of the synthetical production of these substances from less complex carbon compounds. The tendency recently has been toward accepting such explanations for the presence of the substances named.

A very interesting study of the metabolism in diabetes is reported by Joslin.²

The Acid Intoxication of Diabetes in its Relation to Prognosis. C. A. Herter³ considers that it has been established that the coma of diabetes is regularly associated with the excretion of organic acids.

¹ Centralblatt f. innere Med., 1900, S. 417.

² Journal of Medical Research, November, 1901.

³ Transactions of the Association of American Physicians, vol. xvi.

This has been done by the work of Magnus-Levy, Stadelman, Naunyn, and Minkowski.

In health the urine contains four chief acids united to five different bases, and these acids and bases nearly neutralize each other. In diabetes, on the contrary, the total known acids of the urine may fail to neutralize the total quantity of known bases, and there is an apparent excess of bases. The excess of bases over acids is only apparent, for the urine does not contain free alkali. The apparent excess of bases is in reality united to acids, but these are not the known acids; they are organic acids, and the apparent excess of bases is proportional to the quantity of organic acid which is being excreted.

1. A careful balancing of the normal acids and bases of the urine makes it possible to detect the presence of organic acids in the urine and to determine approximately the amount of such acids. The method of Herter and Wakeman is recommended as securing a greater degree of accuracy for the amount of labor expended than any other.

2. The determination of the N of NH_3 is a useful procedure for clinical purposes, since it is probably true that a considerable excretion of organic acid (say 15 gm. of oxybutyric or more in twenty-four hours) is always attended by an increased excretion of NH_3 . As much organic acid as corresponds to 10 gm. of oxybutyric acid may be excreted in twenty-four hours without causing an increased excretion of NH_3 . We cannot, therefore, rely on the ammonia output to detect moderate quantities of organic acids.

3. Where organic acids are removed in considerable amount without increasing the excretion of NH_3 the acid takes out other alkalies, probably in some instances chiefly K.

4. In cases of diabetic coma the urine always contains a large excess of organic acids and the N of the NH_3 is usually increased to 18 per cent. to 25 per cent. of the total N.

5. Crotonic acid can regularly be obtained from the urines of patients in diabetic coma.

6. The condition of diabetic coma is preceded by a period of days, weeks or months, in which there is a large excretion of oxybutyric acid (20 gm. or more in twenty-four hours), and in which the N of NH_3 is largely increased.

7. Patients whose urines show or have shown a large excretion of organic acids are in danger of developing diabetic coma, but the N of NH_3 may temporarily rise as high as 16 per cent., and yet coma be delayed for more than seven months (Case 7). The persistent excretion of more than 25 gm. of β -oxybutyric acid indicates impending coma.

8. A patient passing 30 gm. of oxybutyric acid in twenty-four hours

may still have enough energy and strength to be about all day and perform considerable muscular work.

9. A patient who has been excreting very little organic acid and has gained in weight may within a few months show the presence of considerable quantities of organic acid and die in typical diabetic coma.

10. When the urine contains little or no organic acid there is no immediate prospect of coma; but patients with such urine are probably liable to most of the other dangers that threaten diabetic patients. The relation between the degree of acid intoxication and the susceptibility to infection seems worthy of special experimental study.

11. Where the urine regularly contains more than 200 gm. of sugar per day there is usually considerable organic acid in the urine, and large amounts of acid, indicative of coma, are invariably accompanied by considerable or great glycosuria.

12. Sometimes there is much sugar and little or no acid in the urine, and sometimes there is considerable acid and little sugar. These facts render it desirable to examine the urine of diabetic patients at least once a month with reference to the amount of acid excreted, for the element of acid intoxication must be clearly separated from the element of glycosuria in our study of the progress of a case. In other words, we must recognize the acid intoxication as an important and sometimes as a dominant factor in the prognosis, and this element should be regarded even in those cases of diabetes which have the clinical indications of a mild type of the disease. We may thus hope to prolong life in many instances by taking precautions as to diet and out-of-door life which might not otherwise be deemed necessary.

13. The withdrawal of carbohydrate food frequently leads to a considerable reduction in the quantity of organic acids excreted. The reason for this is not clear as yet, and the phenomenon deserves careful study.

PHENYLHYDRAZIN METHOD FOR THE DETECTION OF SUGAR IN THE URINE. A. Cipollina¹ discusses the methods previously advised for the detection of sugar in the urine by means of phenylhydrazin:

1. *Method of Lamanna.* Four drops of pure phenylhydrazin are poured in a reagent glass, and to it are added ten drops of glacial acetic acid and the same amount of dilute hydrochloric acid, and the glass is well shaken; then add 5 c.c. of urine and boil (kochen) for about one minute over a flame, and cool rapidly in running water.

2. *Method of Kowarski.* In proving the method above he found that a negative result was given when the concentration was under 0.5 per cent. of sugar. Kowarski therefore modified the method of Lamanna

¹ Deutsch. med. Wochenschrift, 1901, No. 21.

by using 1 c.c. of a saturated solution of NaCl in place of the ten drops of dilute HCl, thus receiving phenylhydrazin hydrochlorate and sodium acetate in the nascent state. He obtained positive results with a sugar proportion of 0.1 per cent. The time required for the formation of the crystals varied, according to the amount of sugar present, from a few minutes to a half-hour.

3. *Neuman.* In proving the method of Kowarski he found a negative result with a 0.2 per cent. solution of sugar, and proposed another method. A special reagent tube is marked to measure 3 c.c., 5 c.c., and 7 c.c. Fill the glass to mark "5" with urine, to mark "7" with a saturated solution of sodium acetate in 50 per cent. acetic acid, and add two drops of phenylhydrazin. The mixture is evaporated to about mark "3." A few drops of a solution of caustic soda is now added to diminish the acidity, but the mixture must remain slightly acid. Warm again for an instant, and allow to cool slowly. In watery solutions of sugar he has been able to get reactions with 0.01 per cent.

The author, after trying the above methods, proposes a new modification, but finds that Neuman's is satisfactory, except that it requires a special reagent glass.

4. *Author's Method.* This is a combination of Neuman's and Lamanna's. In an ordinary test-tube is poured five drops of phenylhydrazin, $\frac{1}{2}$ c.c. of glacial acetic acid or 1 c.c. of 50 per cent. acetic acid, and 4 c.c. of urine. Allow the mixture to boil (kochen) over a small flame for about a minute, shaking all the time, in order to avoid as much as possible the active "stossen" from the boiling; then add four or five drops of caustic soda, taking care that the urine remains acid; then boil again for an instant and allow to cool. The results of this method are about the same as those obtained by Neuman.

After many examinations the author finds that the rapidity of the formation of the crystals depends on the specific gravity of the urine. In urines of a low specific gravity (1020 or below) the characteristic crystals appear in from five to ten minutes even with a concentration of only 0.05 per cent., while in urines of high specific gravity (1026 to 1030) the crystal formation requires half an hour or longer even when 0.1 per cent., of sugar is present. In urines containing more than 0.2 per cent. of sugar the formation of glukosazon crystals occur within a few minutes even when the specific gravity is high.

In urines with a high specific gravity and a very small amount of sugar there occurs very gradually a precipitate composed of peculiar glittering yellow spheres of a characteristic appearance, which, on standing, change to more or less well-formed rosettes or only to "stechapelformen." As this change does not occur in normal urine the author looks upon it as a proof of the presence of sugar.

One is not justified in saying that sugar is absent unless the crystals fail to appear after an hour's wait.

DIABETES IN CHILDHOOD. There is still considerable doubt about the frequency of genuine diabetes in infants and young children, on account of the occurrence of physiological glycosuria in nurslings and children. Orlov¹ reports a case in a child between four and five months old. The urine contained large amounts of sugar. There were polyuria, polyphagia, and autophagia present. The child had also a number of boils on its body. Death occurred twelve days after admission, and the autopsy showed acute bronchopneumonia, with pulmonary oedema, acute intestinal catarrh, oedema of the dura, and a serous effusion in the third ventricle. The author considers the ventricular oedema as the cause of the disease. He thinks that this is the first genuine case of diabetes recorded in an infant. A number of other cases have been reported which seem equally convincing. One in which the symptoms were not quite as suggestive was reported during the past year by William E. Young.² The patient was a foundling, aged about six months. For two weeks after admission the child did well. He then began to vomit, lost weight, stools were greenish in color, skin became dry and wrinkled, and the baby was nervous. The appetite remained good, and the temperature was never above 99° F. A swelling was noted in both lumbar regions, and the abdomen was distended. The liver was enlarged, and the kidneys were about four times the normal size. The urine examination revealed 5 per cent. of sugar. Treatment was without result, and the child contracted pneumonia and died just one month after the onset of the symptoms. Autopsy showed the kidneys to be twice the normal size; the cortical layer was grayish-white and indurated; the parenchyma was hyperæmic and inflamed. The mucous membrane of the bladder was inflamed and the liver enlarged. All the other organs appeared normal.

The author thinks that scarlatinal nephritis, marasmus, and arthrepsia as causes of the sugar could be excluded. He calls attention to the few cases reported in the literature in young children. No history of diabetes in the family could be obtained in this case.

A. C. Cotton³ reports a case in a girl, aged six years and three months. The family history was negative as far as gout, diabetes, tuberculosis, and syphilis were concerned. In April, 1900 (aged five and a half years), the child had measles. Following this she became nervous, irritable, and lost flesh. In August, 1900, the thirst and polyuria were first remarked. Physical examination, February 1, 1901,

¹ *Vratch*, March 3, 1901.

² *Archives of Pediatrics*, March, 1901.

³ *Journal of American Medical Association*, September 7, 1901.

showed emaciation, dry skin, harsh hair, and carious teeth. Heart, lungs, liver, and spleen showed no abnormalities. Patellar reflex absent. The patient died on March 11, 1901, in dyspnoic coma. Quoting from Dr. Stern's¹ statistics on diabetic mortality in New York for eleven years—1889 to 1899—it gives :

Total deaths from diabetes mellitus	1867
Deaths under 1 year of age	4
“ “ 10 years of age	24

Thus of those dying from diabetes 0.214 per cent. were under one year of age, and 1.28 per cent. were under ten years of age.

In Chicago for four years—1897 to 1900 (his own statistics)—the total number of deaths from diabetes mellitus was 418 :

Deaths under 1 year	3	0.71 per cent.
“ “ 10 years	15	3.58 “

Thus in 2285 deaths from diabetes mellitus seven, or 0.31 per cent., were in children under one year, while thirty-nine, or 1.7 per cent., were in children under ten years of age. Assuming that diabetes is an hereditary disease, and recognizing its unfavorable course in childhood, Cotton advises that prophylactic measures be employed in all children whose immediate ancestry show gout, diabetes, tuberculosis, or syphilis. This includes care in diet, with avoidance of saccharine, etc., avoidance of trauma, mental strain, exposure, frights, etc. As preglycosuric signs he mentions incontinence of urine, muscular debility, irritability, and progressive emaciation in spite of a voracious appetite. More care is necessary in regulating the diet of children than that of adults. There is a high ratio of metabolism in children.

DIABETES COMPLICATED BY CHOREA AND PAROTITIS. Peacocke² reports the case of a patient who developed while under treatment a hemichorea affecting the left arm and leg. Movements were absent during sleep. The condition lasted for nine days, during which time he was put on large doses of arsenic and trional. The same patient developed an inflammation of the right parotid, accompanied by fever. The author has been unable to find a record of any such complication in diabetes. The patient was aged sixty-four years, and died. No autopsy was reported. Glycosuria has been occasionally noted as occurring in parotitis, and inflammatory lesions of various sorts are not infrequent in the course of diabetes. Doubtless parotitis would occur in this way, though it is undoubtedly a rare complication.

¹ Medical Record, November 17, 1900.

² Dublin Journal of Medical Science, January, 1902.

DISEASES OF THE THYROID GLAND.

Myxœdema and Cretinism. Authors are uniformly disposed to classify these affections as varieties of one disease of metabolism or internal secretion. The variations in the clinical manifestations are due to the time of onset and the degree of glandular disorder. Ewald¹ divides the myxœdematous conditions into (*a*) myxœdema proper—a disease of adults, generally females; (*b*) cachexia strumapriiva, or, as he prefers to call it, cachexia thyreopriva—a condition resulting from too complete a removal of the thyroid in goitre operations (a condition now rarely seen, as a portion of the gland is always left behind); (*c*) infantile myxœdema or sporadic cretinism. There is no etiology that is known. The chief pathological changes are located in the thyroid and the skin.

The treatment is a form of substitution. The administration of any of the forms of thyroid extract must be carefully watched and interrupted when symptoms of thyroidism appear. Ewald claims that when small doses of arsenic, in the form of Fowler's solution or arsenious acid, are given at the same time as the thyroid extract the appearance of the symptoms of thyroidism are not met with. Thus he reports giving 962 tablets of "thyroidin" in succession without any signs of thyroidism, and attributes this to the fact that Fowler's solution was given in daily doses of three drops at the same time.

A number of cases have been recorded in which ill-defined symptoms of cretinism constituting rather a state of infantilism have been traced to disease of the thyroid gland. In this group of conditions may be placed the cases described by H. Quinke² as a condition which he terms athyreosis. His first case occurred in a boy, aged six months, who was brought under observation on account of thickness of his tongue and difficulty in swallowing. There was a cretinoid appearance. The thyroid gland was found to be a hard mass, the size of a pea. Under thyroid treatment improvement occurred, and when this treatment was stopped the condition deteriorated. After a few years the child died of an intercurrent disease, and at the autopsy there was found complete absence of the thyroid gland. The thymus gland was small, the bones showed signs of rickets, and the teeth were represented merely by brownish stumps. Among the symptoms of this case were nystagmus and nodding movements of the head. In the second case a girl who had been well up to the age of fifteen months began to show signs of stupidity, loss of speech, which had been partly established, cessation of walking, and changes in the teeth. Under thyroid treatment notable

¹ Deutsch. Klinik, 1901, No. 3.

² Deutsch. med. Wochenschrift, 1900, vol. xiii.

improvement occurred, and the child is still under observation. The fact that in both of these cases the symptoms came on some time after birth seemed to indicate that they are not instances of congenital cretinism, but of atrophy of the thyroid gland. The author, therefore, calls them cases of *athyreosis subacuta*.

That the disease (myxœdema or cretinism) is one of disordered secretion rather than a specific form of thyroid disease is shown by the variety of affections of the gland with which it has been found associated. Among other conditions, syphilitic gummata, actinomycosis, and tumors may be named. Any form of goitre may occasion myxœdematous symptoms.

J. A. Kirschi¹ records a case of exophthalmic goitre, with symptoms of myxœdema, in a woman aged thirty-three years. The patient had suffered ill-health for some months after typhoid fever, and the symptoms of exophthalmic goitre developed acutely after a fall which had frightened her greatly. The evidence of hyperthyroidism continued for about two months, and then gave place to myxœdematous symptoms. The face and legs swelled, the skin became dry, the memory poor, and the thyroid gland somewhat indurated.

Another instance of the same sort is reported by Leonard Guthrie.² He showed a patient, aged fifty-eight years, first seen two years before. She then complained of palpitation, dyspnœa, trembling, flushing, profuse perspiration, vague aches and pains, constipation, and general debility. Her menses had ceased for two years. Four months previously she noticed an enlargement of the neck, and the thyroid was found enlarged. There was no proptosis, but the heart was irregular and intermittent, and the pulse-rate was persistently from 120 to 130. She had also tremors. There were no signs of myxœdema, but thyroid extract was given in 5-grain doses at night. She professed to feel great relief from this, and the thyroid gland diminished in size so that in October, 1899, it was barely perceptible. She continued taking a 5-grain tablet of thyroid extract every night until June, 1900. At this time treatment was discontinued, and she was not seen until December, 1900. At this time she presented all the signs of myxœdema. She had grown very bulky, and was so weak she could hardly walk. Her skin was coarse and quite dry, complexion yellow, cheeks flushed, eyelids bluish and baggy, hair and eyebrows falling off, speech thick, indistinct, and slow. The thyroid gland could not be felt, but there were two large, soft swellings above the clavicles which she had noticed for about a month. A fortnight's treatment of thyroid extract caused a

¹ Wien. klin. Wochenschrift, July 5, 1900.

² Lancet, January 12, 1901.

disappearance of the myxœdematous symptoms, but the pulse was as rapid as it had been at first.

Although only a few cases of myxœdema following Graves' disease have been reported, the author thinks the sequence is not uncommon. A very interesting case of cretinism was reported by Packard and Hand.¹ The patient was aged six years when first seen. He measured 81 cm., could not talk, and understood only a few words. The tongue was constantly protruded from the mouth, and was very large. The thyroid could not be made out on account of the thickness of the neck. The genitalia were well developed. Otherwise the child resembled the usual cretin. While perfectly able to eat and swallow solids, he was unable to swallow liquids. Under the use of thyroid extract the improvement was decided. The mentality was improved, he became able to swallow liquids, the tongue was held in the mouth, etc. This treatment extended over a period of a year, with a few intervals, during which the thyroid was omitted. At the end of this time the child acquired typhoid fever and died within a week of the onset of the disease. The writers comment on the lack of resisting power shown.

Attention is called to the following points : The rapid improvement under the use of the thyroid extract ; the extremely malignant and rapid course of the typhoid ; the presence of an enlargement of the pituitary body ; the great increase in the size of the thymus gland ; the presence of the thyroid gland and the extensive disease of this, with calcification of the walls of the arteries going to it. In addition to this, the intensity of the lesions produced by the typhoid toxin, and especially the necrobiotic changes occurring in the liver, are worthy of mention because of their possible bearing upon the question of the resisting power of cretins treated by thyroid extract.

The writers were unable to find references to the resisting powers of the cretin, yet in their case the resisting power was so slight that it suggests the possibility of the thyroid extract being causal. As to the enlargement of the pituitary gland the authors could find reports of only two other cases—one case by Boyce and Beadles² and one case mentioned by Comte.³ Particular mention is made of these changes in the pituitary body on account of the observations of Rogowitsch, which seemed to show a compensatory action of the pituitary body in cases of the experimental removal of the thyroid in animals.

The writers were likewise unable to find any reference to a calcareous change of the thyroid bloodvessels such as was present in their case. As to the significance of this change nothing can be said, but the

¹ American Journal of the Medical Sciences, September, 1901.

² Journal of Pathology and Bacteriology, 1893.

³ Quoted from Burckhardt. Ziegler's Beiträge, 1898, Band xxiii. p. 104.

observation is of some interest on account of the supposed relation between the various diseases connected with the thyroid gland and the drinking-water. Letters written to the home of their patient brought but few replies. One surgeon wrote that he has two or three goitre cases constantly under his care, while the father of the patient stated that there were two other children in his neighborhood who were in a condition similar to that of his son.

TREATMENT. The value of thyroid medication is so firmly established that little can be added. There are, however, cases in which the treatment proves disappointing. The reasons for such failures are often obscure, and the subject needs further investigation.

R. C. Leeper¹ reports two cases of myxœdema treated with thyroid extract, in one of which there was no improvement after two months, but subsequently marked relief from the mental and other symptoms of the disease. In two other cases in which there was improvement it was noted that the gland increased in size in one, while it decreased in the other. A suggestion of value in the treatment is that of Ewald,² who advises the administration of Fowler's solution with the thyroid preparations. Raudnitz³ reports a case showing the influence of the thyroid treatment. The patient was a child, aged eight years, with thick, dry skin, waddling gait, large abdomen, pulse 76, temperature 37.2° C., cerebation almost *nil*, height 90 cm. Thyroidin was begun October 10, 1900, and from then until October 20 the child was given one-half pastil daily, and from then until November 29 of the same year one pastil daily. The temperature rose to 37.5° C., the pulse to 136, the height being on November 6, 91.4 cm., on November 27, 93.2 cm. From the end of November until January 8 no thyroid was given. The appetite failed, apathy returned, and the pulse fell to 84. From January 8 to February 7, 25 grains of thyroidin were used. The height on January 26 was 95.3, the pulse 120. There was no treatment until April 18, and from then on again 25 grains of thyroid were given. The height increased April 16 to 97.5 cm.; on June 7 to 98.5 cm. The author calls special attention to the findings of the X-ray both as a means of diagnosis and as proof of progress. When first examined the hand (X-ray) resembled that of a child one and a half years of age. There were only two centres of ossification in the carpal bones and one in the epiphysis of the radius. Under the thyroid treatment on June 7th the centres of ossification were fully developed in all the phalanges. The metacarpal bones showed beginning ossification in the distal epiphyses, as also in the proximal on the thumb and

¹ British Medical Journal, January 20, 1900.

² Vide supra.

³ Prag. med. Wochenschrift, 1901, No. 27.

forefingers. Mentally the child was much better and acted like an ordinary child, though backward with strangers.

Exophthalmic Goitre. ETIOLOGY. The nature of this disease still remains somewhat unsettled. Those who adhere to the older theory of a nervous origin must explain the variable pathology of the gland itself in the disease and the undoubted benefit of partial removal of the gland. On the other hand, those who assert that the disease is due to disordered excessive secretion find in the same facts a strong support for their theory. The variable lesions of the gland may be accounted for in much the same way as those of myxœdema. Disordered secretion of a gland may be caused by very different lesions.

Adami,¹ in a discussion of the symptoms and causes of goitre, holds that there is a relationship between the cases of simple goitre, the exophthalmic variety, and the myxœdematous.

SYPHILIS OF THE THYROID GLAND. R. Abrahams² reports three cases of exophthalmic goitre in which a specific origin was suspected. In the first case a woman, aged thirty-five years, had a clear history of specific infection in 1894, with a distinct local lesion and secondary eruption as well as lesions on the mucous membranes. Treatment was instituted, but five months later exophthalmic goitre developed. Improvement finally occurred by the administration of sodium iodide in large doses. All of the symptoms of Graves' disease vanished. In the second case a woman, aged thirty-six years, had distinct signs of infection, and developed symptoms of Graves' disease two years later. Inunctions during six weeks caused a disappearance of the symptoms. In this case the author had to depend upon the history given by the patient. The third case occurred in a woman, aged twenty-seven years. There was a very clear history of infection, with the development of the signs of exophthalmic goitre when the infection was supposed to have been cured. Enlargement of the thyroid gland began three months after the palpitations. A year later she was treated with iodide of soda, the dose being increased to 3 grammes a day. In less than a month the symptoms ameliorated.

HYPERTHYROIDISM AND EXOPHTHALMIC GOITRE. The occasional production of symptoms resembling those of Graves' disease by thyroid medication and the beneficial effects of partial ablation of the gland in that disease furnish strong evidence in favor of the view that exophthalmic goitre is caused by excessive thyroidal secretion. The occurrence of a toxæmia is well shown in a paper of Walter Edmunds.³ Whether the causation of Graves' disease is primarily in the nervous

¹ Montreal Medical Journal, January, 1900.

² Philadelphia Medical Journal, February 9, 1901.

³ British Medical Journal, September 21, 1901.

system or in the thyroid, there can be no doubt that the abnormalities, wherever they may be, are of a chemical nature. In order to show the effect of the removal of the thyroid on the nervous system eight dogs were experimented on. In four the thyroids and parathyroids were excised at the first operation, while in the other four the total excision was done in two sittings, with an interval between. In all cases dealt with the usual symptoms followed the complete (or completing) operation within a few days. The cord and medulla, and in one case the brain, were preserved in methylated spirit or in formalin and methylated spirit. The specimens were embedded in paraffin, cut, and stained by Nissl's method. Some few were stained by the method of Heidenhain.

Examination of the specimens showed the same changes in all the experiments, varying in degree, but in the most marked specimens there were profound changes. The Nissl "bodies" were no longer defined; the substance sometimes appeared as fine dust, and sometimes the chromaphilous elements seemed fused together, and had, in fact, undergone "chromatolysis;" sometimes the substance in the cells, in specimens which had been properly prepared, took the stain too deeply. In some of the cells the chromaphilous substance was absent, only the network within the cells being visible; in some of the cells there was considerable swelling of the nucleus; of some of the cells the processes were wanting, and, in fact, cells might be found in every stage of destruction.

These changes are very similar to those described as occurring in acute poisoning; in fact, it appears that athyroidea is a form of acute poisoning affecting the central nervous system.

From the fact that the acute nervous symptoms can be produced by removal of the parathyroids alone, and only myxedema, or not even that, by the excision of the thyroid alone, it seems probable that the absence of the parathyroid secretion is in some way the cause of the acute symptoms, and, from the nature of the changes in the cells, it seems that it acts by its presence being necessary to the extraction from the blood and deposition in the cells of the Nissl bodies, which are supposed to be the food of the cells. As Gley has shown that there is a large amount of iodine in the parathyroids, it is natural to suppose that iodine plays an important part in these chemical reactions. In Graves' disease the colloid does not stain as deeply as the normal colloid; it has undergone a chemical change.

As to the pathology of Graves' disease, its symptoms so much more resemble the nervous symptoms following the removal of the parathyroids than myxedema, which we know to be due to defect of the thyroid proper, that it suggests itself that Graves' disease is due to partial

aparathyroidea, and in autopsies on cases of Graves' disease the parathyroids should be carefully examined.

Gley reviews the various experiments on the thyroid. He thinks there is a true functional association between the thyroid and the parathyroids.

The active substance of the thyroid secretion is an iodoproteid. The iodine has been found to be diminished in exophthalmic goitre by the author and by Oswald.

If the thyroids and parathyroids are considered to be functionally associated, and that, for example, the proteiodide substance is not produced in the thyroid without the assistance of the parathyroids, it follows that if the latter are altered its formation is diminished. By degrees we come to this theory, that exophthalmic goitre is due to an alteration in the thyroid apparatus involving, in the first place, the parathyroid, whose normal function is disturbed.

Haskovee thinks that in exophthalmic goitre the thyroid gland is diseased, and that the symptoms are produced by the entrance of toxic substances into the organism which have a selective action on the sympathetic. Gley is evidently inclined to believe this theory.

R. Breur¹ thinks that the chronic iodine poisoning described by older writers was really acute thyroidism. The symptoms were generally observed in cases of goitre treated with iodine, and were practically those which he himself has observed and which conformed to what is now regarded as acute thyroidism. As an instance a case of goitre in a man, aged fifty-six years, may be cited. After receiving sodium iodide in moderate doses the goitre was greatly reduced in size, but the patient lost flesh, became extremely excitable, and developed a tremor and rapid pulse. The symptoms subsided when the drug was withdrawn. Several other cases of the same sort are cited. In the same connection may be quoted a case of F. G. Haworth,² who found remarkable apathy in a girl, aged sixteen years, with slight goitre, after the administration of thyroidin. The patient after three weeks of treatment became sleepy and lost her memory to a large extent, and perspired excessively on slight exertion.

THE NERVOUS THEORY is advanced in the report of a fatal case observed by Kedzior and Zauietowski,³ who report the case of a girl, aged eighteen years, who had never menstruated. Enlargement of the thyroid began at the age of fourteen years. Later there appeared tremor of the hands, weakness of the extremities, exophthalmos, palpitation, a tendency to sweating, and dyspnoea. Operation was performed,

¹ Wien. klin. Wochenschrift, July 19, 1900.

² British Medical Journal, September 1, 1900.

³ Neurolog. Centralbl., 1901, No. 10.

and the right lobe of the thyroid was resected, while the superior and inferior thyroid arteries were ligated at the left side. The general condition of the patient improved. (Operation, May, 1899.) After this the pulse dropped from 120 to 80. In the beginning of 1900 the condition became worse than before the operation. The dyspnœa became more marked, and almost every month there was an attack of an epileptic nature, with abdominal pain. Death occurred in March, 1900. At the autopsy pneumonia (croupous), hypertrophy of the thymus, dilatation and hypertrophy of the heart were found. In the brain there were signs of new and old hemorrhages in the medulla, throughout the entire length, and most marked in the region of the left olivary body. The left restiform body was much smaller than the right. The microscope showed nothing abnormal in the large or small brains and cord excepting the hemorrhages above referred to, which were characterized by their dark color. In the upper part of the medulla, while the pyramidal tracts and olivary bodies were stained red, both restiform bodies were yellowish, the left one waxy in color. The right one presented a surface one and a half times as large as the left. The left cerebellar tract (*klein hirn seitenstrang bahn*) and the nucleus of the left tenth nerve appeared smaller than those of the right side. The middle and lower part of the medulla showed a high-grade left-sided asymmetry, though there was no difference in the course of the fibres. The authors think that the changes in the left restiform body lay at the bottom of the disease in this case.

O. T. Osborne¹ regards exophthalmic goitre more common than is usually believed, especially in the centres of population, where the conditions of life render women nervous and emotional. He believes that some disorder of the uterus or adnexa is the exciting cause, while a nervous temperament or a condition of nervous excitation is the underlying cause. During the first five years of the trouble he believes there is much probability of recovery should suitable treatment be instituted. Later on the prognosis is graver, and local treatment and rest should be preliminary measures. Thymus extract has seemed useful to him, and sodium phosphate, if given over long periods, is valuable.

J. R. Arneill² reports an instance of acute Graves' disease which occurred in a woman, aged thirty-three years, in whom enlargement of the neck was first observed seven months before death. Tachycardia did not develop until four months before death, and followed a severe emotional shock. Nervous symptoms, severe digestive disturbances, and rapid loss of weight also followed the shock, and toward the end of

¹ Medical News, September 8, 1900.

² Journal of American Medical Association, October 6, 1900.

life there was slight fever. Exophthalmos did not develop at any time. He believes that in cases of very acute Graves' disease there will generally be found on careful study some evidence of the previous existence of the disease, and that the acute course will be recognized to have followed some sudden shock or other factor of this sort. If the disease has not been present before there will usually be found an unstable condition of the nervous system which predisposes to the final malady.

J. D. Harris¹ reports the death of a patient with marked exophthalmic goitre who was operated upon for a non-malignant breast tumor. He thinks the danger arises from the heart, and advised against operation in advanced stages of the disease. (No reference made to operation on the thyroid.)

Moebius² has employed the serum of animals from which the thyroid has been removed (*schilddrueslosen*) in the treatment of exophthalmic goitre, and has noted a decided improvement in three cases. Possibly the flesh of the animal would suffice, as it probably contains enough blood for the purpose. As treatment is usually without result, he thinks that all means should be tried. He has not observed any albuminuria from the administration.

Thyroiditis. Acute inflammatory conditions of the thyroid gland are not very rare in the course of infectious fevers. In some cases they terminate in suppuration, and it is not improbable that when resolution takes place the foundations for subsequent chronic enlargements (goitre), or for atrophic conditions with such consequences as myxedema, may follow. The following cases illustrate the conditions under discussion :

A. Schudmark and J. A. Vlachos³ describe a case of suppuration of the thyroid gland after typhoid, in which there was first enlargement of the thyroid, and subsequently considerable increase, with development of an abscess containing the typhoid bacilli in pure culture. When suppuration occurred leucocytosis developed instead of the reduced number of leucocytes present before.

R. Broceur⁴ records an instance of exophthalmic goitre following thyroiditis due to staphylococcus infection. The case proved an acute one, and terminated fatally in six months after the development of severe cerebral symptoms. The thyroid gland at autopsy was found to contain remnants of an abscess, with a parenchymatous degeneration of the remainder of the gland. The symptoms of Graves' disease were well marked in the case, and the author believes it a proof of the primary thyroid origin of Graves' disease.

¹ British Medical Journal, May 4, 1901.

² Münchener med. Wochenschrift, November 12, 1901.

³ Wien. klin. Wochenschrift, July 19, 1900.

⁴ Berl. klin. Wochenschrift, July 12, 1900.

ACROMEGALY.

Acromegaly is still in some respects a condition whose pathogenesis is uncertain. A few years ago the dependence of acromegaly on diseases of the pituitary body seemed more or less established ; but other experience shows that the disease is not invariably associated with pathological conditions of the gland, and that, therefore, its dependence upon pituitary disease is less direct than supposed. Whether the enlargement of the hypophysis is merely a symptom in the disease remains to be determined. Damsch, in Ebstein and Schwalbe's *Handbuch der Praktischen Medicin*, gives a very satisfactory discussion of the whole subject. It will be profitable to extract this. It will be seen that he is one of those who do not believe the symptoms of the disease are the result of involvement of the hypophysis. He states that acromegaly occurs in both sexes, but more frequently in man. It occurs most frequently after puberty, but may appear before or even in advanced age. Nearly all the cases are from the lower classes. Heredity plays no part in the causation. External circumstances are likewise of no moment. For a long time previous to the onset of the disease vasomotor disturbances in the form of transient swellings of the hands and face have been noted. The first symptoms of the disease proper are nervous paræsthesia and pain in the head, back, and extremities, vertigo, and the patient is easily tired, etc. These symptoms are often mistaken for hysterical or chlorotic manifestations, especially in women in whom dysmenorrhœa or amenorrhœa is one of the earliest symptoms. After these, accompanied by increase in the pains, appear the characteristic thickenings in the hands and feet, followed in time by the changes in the face. The deformities in the hands and feet are due to a thickening of the bones, chiefly in the neighborhood of the joints, though the soft parts are also affected. These changes are readily shown by the X-rays. The alterations extend upward, with diminishing intensity, to the forearm and leg ; the thigh and arm are usually unaffected. The changes in the face affect the under jaw, which becomes broader, so that the under incisors project in front of the upper. In many cases the upper maxillary, malar, and the occipital bones are thickened. The nose is longer and broader, the under lip thickened, enlargement and thickening of the ears, tongue, and larynx occur, and sometimes exophthalmos. These changes produce the so-called "hexagonal face." The skin is hard and often markedly pigmented. The changes gradually reach a climax, and then remain stationary. There may be deformities of other bones, though in a less marked degree. Thus there may be a dorsal kyphosis, so that the chin approaches the chest. The

sternum and the clavicle become irregularly thickened on the sternal end, and often the patella is deformed. Motor disturbances are of mechanical origin, and consist in difficulty in movement of the limbs, (unintelligible speech, thickening of the tongue), interference with chewing by deformity of the jaw and tongue, deep and rough voice from enlargement of the larynx. The skin and mucous membrane are more or less thickened in all layers, and the subcutaneous fat is often increased. On the skin there is often pigmentation, increased growth of hair, keloid growth, and frequently increased sweat secretion. The muscles are weak in development, but there is no palsy. The electric reaction is normal. The disturbances of the special senses—sight, smell, hearing, and taste—are due to pressure from enlarged hypophysis ; so are the headache and vertigo. Besides these organic changes there are often general nervous manifestations, as general psychical depression or exaltation, disturbance of sleep, etc. It is doubtful if there is any connection between the nervous disturbances and the frequent changes in urine secretion. In spite of the increased sweat production there is often polyuria, either simple, or glycosuria. It is not certain whether this is a true diabetes or an alimentary glycosuria. This glycosuria is subject to variation, disappearing on regulation of the diet, or, even of itself, to recur later. The inner organs are normal with the exception of the heart, which often shows a more or less extensive muscular insufficiency. Finally, there may be early atrophy of the uterus in connection with the amenorrhœa, nervous disturbances of the bladder, and dilatation of hemorrhoidal veins. The thyroid may or may not be enlarged or diminished in size. The thymus gland retains its size in some cases. The demonstration of this by percussion must be done with caution, as the thickening of the sternum may give a deceptive note. The disease is essentially chronic, reaches its height in from three to six years, and then remains stationary.

The author reports the case of a woman, aged forty-five years, whose last pregnancy was twenty years previously, since which time there has been a tumor in the abdomen. Cessation of menses occurred four years ago, since which time there has been an increase in size of the extremities, nose, ears, under lip ; vertigo, headache, spots before the eyes, little thirst. The size of the hands varied. At the time of the examination they were moderately enlarged. The feet increased in size, and showed varices and œdema. The tongue was large. Line of teeth not altered. The pupils were narrow and reacted slowly ; no lessening of the visual fields. There was a left-sided abscess in the antrum of Highmore. The thorax was flat, dorsal kyphosis was present, and the chest muscles were poorly developed. The mammae were lax and secreted considerable milk. Lungs were normal. Heart enlarged to the right ; no

murmurs. Abdomen full and soft ; tumor, size of fist, to the left of the median line, freely movable and connected to the uterus, which was small and anteflexed. No pregnancy. Liver enlarged. Urine normal.

Dr. Charles L. Greene¹ reports a case of similar interest and discusses the diagnostic features. The patient was aged twenty-five years, male. Occupation for some years prior to the appearance of the disease was that of an ice cutter. The author thinks the attendant exposure may be causal. Family history negative. No syphilis. Five years previously, at the age of twenty years, the patient noticed a rapid enlargement of his hands and feet, and his friends remarked a change in his physiognomy. He began to feel weak and could not work steadily. Examination in 1898 showed : hands and feet enormously enlarged ; wrist and ankles free from inflammation, but bulky, thick, and strong in comparison to the upper four-fifths of the arms and legs, which were normal. The patient complained of languor and weakness, but had none of the vertical pains in the lumbar region or legs. There were no disturbances of the special senses or of the general nervous system. The skin was normal, except on the face, where it was hypertrophied, but not rough. The eyelids were thickened ; ears and nose enlarged, malar bones projected, lower jaw enlarged from angle to symphysis and vertically. The upper jaw was enlarged, with separation of some of the teeth and marked forward projection of the superior dental arch. The tongue was moderately enlarged, as was the larynx. At the time of examination there was no change in the clavicles, scapulae, or spine. Radiograph showed the enlargement of the hand and foot bones, together with the adjacent tissue. The great toe was not specially enlarged. There was dulness over the sternum, which the author thought was due to an enlargement or persistence of the thymus. The knees showed chronic synovitis. The soft parts of the hands and feet resembled myxœdema. The peculiar features were the lack of prominence of the lower jaw (hid, perhaps, by the enlargement of the upper) and the resemblance to myxœdematous change. The diagnosis was made from : 1. Myxœdema. Here the bones are not involved ; there is marked mental depression, apathy, or irritability ; falling out of the hair ; tenderness, often extreme, over various portions of the body ; involvement, marked, of the soft tissues. He thinks that as the thyroid is involved in acromegaly, and the disease is sometimes influenced by the administration of drugs, that the two conditions may exist together. 2. Osteitis deformans. 3. Giantism. Here he thinks the etiology is the same. 4. Pulmonary osteo-arthritis.

¹ Journal of American Medical Association, October 5, 1901.

W. G. Shalleross¹ reported two cases of this disease occurring in feeble-minded males, aged eighteen and twenty years. Both presented the usual deformities of the face, hands, and feet. Both had optic atrophy, excessive sweating, albuminuria (slight), and hyaline casts. At one time sugar was found in the urine of the younger patient. Only one (the less advanced case) had the headache which is usually so marked. In both, however, there was a marked hypertrophy of the genital organs, and the auto-erotic phenomena were unchanged. In the more advanced case there was dulness under the sternum, which the author thought was due to an enlarged thymus. With advance of the disease the patients seem to lose in mentality.

Pathology. The increase in size of the bones is due to a pure hypertrophy ("thickening of the periosteum ; also subperiosteal and supracortical bone-formation, to which may be joined an endosteal bone-formation leading to sclerosis of the bone," Arnold), without inflammation. Exostoses, hyperostoses, and osteophytic growths have been described. Besides these hypertrophic processes atrophic conditions are found on the lateral aspects of the skull and on the ethmoid and sphenoid bones, the latter being due to the hypophysis tumor. The skin and vessels, likewise the sympathetic and spinal nerves, show marked increase in connective tissue. The muscles show degeneration along with connective-tissue growth and fat deposition between the fibres. There have been found a persistence of the thymus ; in many cases frequent anomalies in the thyroid which may be large or small, and, with special frequency, tumors of the hypophysis. In fifteen autopsies Hanseman found the gland enlarged in twelve cases. The enlargement was due generally to tumors—adenoma, glioma, and sarcoma. The author does not believe, with Marie, that the disease is due to the affection of the hypophysis, and thinks its involvement is a symptom of the malady. The frequency of its enlargement he explains on the ground that it simply takes part in the increased growth characteristic of the disease. He does not think that the frequent persistence of the thymus has any causal relation. He leaves out the thyroid as a factor on the ground of its inconstant behavior, the fact that in myxœdema there is no change found in the bones, and the administration of thyroid is without result. For the present he thinks the disease must be considered as a chronic anomaly of metabolism, the nature and cause of which are unknown. There may be some relation between the early regressive anomalies in the sexual organs and the disease. Thus in women there is almost constantly amenorrhœa and atrophy of the uterus. He mentions a case of Strümpell's in which the ovaries were removed in this disease. The

¹ Philadelphia Medical Journal, April 20, 1901.

ovaries were normal, and no change was produced in the disease. The diagnosis must depend on the characteristic changes in the bones, etc.

Differential Diagnosis. The author mentions only one condition that may give rise to confusion. This condition arises in congenital heart disease and chronic suppuration of the lung, especially bronchiectasis. In milder forms, where only the drumstick deformity of the fingers and toes appears, the diagnosis is not difficult. At times, however, along with this are found changes in the clavicle, sternum, and also in the skull. The changes in the skull are more frequent on the vault than on the face, thus differing from the acromegaly in appearance.

Prognosis. This is always unfavorable in that the accompanying symptoms make life miserable, and the patient cannot work, while he is more liable to intercurrent disease. Whether the disease may stop before its full development is reached is uncertain. Some patients or individuals are seen who seem to have the acromegalic changes in well-marked form, but who show no interference with mental or physical ability.

Treatment. Nothing seems to have an influence on the disease. Organotherapy seems fruitless, except that in some cases thyroid preparations have lessened the subjective nervous symptoms. If the view of Marie is correct, and acromegaly is the result of disease of the pituitary gland, administration of preparations of this gland ought to give useful results; but if, on the other hand, the pituitary enlargement is a mere incident in a disease due to some other cause, the exhibition of pituitary substances can have no specific effect. In a paper on the treatment of acromegaly Sydney Kuh¹ obtained varying results. The author makes the statement that "changes of some kind have been found in the pituitary body in all cases of acromegaly in which there could be no doubt of the diagnosis and in which a careful microscopical and macroscopical examination of the gland was made." Nearly all cases of acute acromegaly are due to sarcomata of the pituitary gland. He believes that the hypophysis exerts some influence on the growth of the body, and, while he does not say so, evidently thinks that acromegaly is produced by a diminution in the function of the gland, and thinks sufficient evidences are at hand to justify the use of pituitary gland in this disease. He reports three cases (none of them with autopsies) in which this treatment was employed.

Case I. Man, aged twenty-nine years. Jewish. Feet and hands enlarging for five years. He had headache, marked sweating, dulness over the sternum, loss of sexual power, genitals of average size, diabetic

¹ Journal of American Medical Association, February 1, 1902.

cataract (no report of urine), and emaciation. Pituitary gland treatment gave no result, but depression was perhaps less.

Case II. Woman, aged thirty years. Swede. The case had been developing for two years. Increase in size of the extremities, change in voice, headache, trophic changes in the nails. No sweating. Almost no changes in the skull. Menstruation normal. No mental changes. On pituitary gland (5 grains t. i. d.) the headaches disappeared and she regained in strength. This treatment was continued a year, when she began to have cramps in the legs, which caused insomnia, and she became greatly depressed mentally. No objective changes were produced by the administration of the pituitary body.

Case III. Man, aged fifty-eight years. Jewish. Had had frequent attacks of asthma. Constipation for two years and headache. Says his head was always large. Noticed no change in the size of his extremities himself, but friends have called his attention to it. During the past two years there had been excessive perspiration. No visual changes. Voice deep and hoarse. Heart showed mitral insufficiency. There was emphysema and arterio-sclerosis. Hands, feet, and head showed signs of acromegaly. From February to December, 1900, he was on pituitary gland, with improvement of symptoms. Sweating and headache had disappeared, and he felt stronger. He had an attack of asthma, and died suddenly. The author thinks the last two cases seem to show that pituitary gland was beneficial.

ADDISON'S DISEASE.

Little has been added to the pathology of Addison's disease. It is practically certain that gross disease of the suprarenal capsules or disturbances of the functions of this gland constitute the underlying etiological condition. The cases in which the gland has been found normal to all appearances have been cited as evidencing some connection with disease of the sympathetic nervous system or other structures; but in view of the discoveries in the pathological physiology of the gland and its secretions, the direct association of disorders of this gland, either organic or functional, can scarcely be doubted. The investigations of Blum, Zülzer, Croftan, and Herter, referred to under the heading of Diabetes, are of great interest, but are considered more properly in that place than in the present. B. de Vecchi¹ carried out his experiments on rabbits. All aseptic precautions were taken in his operations. After the incision was made down to the suprarenal it was picked up with

¹ Ueber Experiment. Tuberculose der Nebennieren, Centralbl. f. allg. Path. u. path. Anat., July, 1901, Band xii., No. 14.

forceps ; a small opening was made in the gland ; tubercle bacilli (whose virulence had been proved) were introduced with an oese, the wound in the gland cauterized, and the muscle and fascia brought together and skin closed by iodoform collodion. All the animals survived the operation. No narcosis was employed. The animals were killed at varying periods, and during life observations were made as to weight, temperature, blood, and general condition. The author was unable to examine the urine. Autopsies were made directly after death, the important organs being carefully collected and hardened. No complications, such as tuberculous peritonitis or abscesses, were met with. All but two animals were killed, these two dying of themselves about three and a half to four months after inoculation.

The weight of the animals remained unchanged for a short time after operation, and then gradually diminished up to time of death. The temperature examination was unsatisfactory, but he thinks there was a rise after operation that returned to normal in about two weeks. Blood examination showed a diminution of the red cells to about 2,000,000 per c.mm. The animals were depressed, trembled at times, the hind legs became paretic, they ate little, and moved only when incited. The anatomical result depended on the time when death occurred. After six to eight days the gland was apparently normal except at the site of the wound, where connective tissue had developed. In the loose connective tissue tubercle bacilli were found plentifully, while only a few were found in the new tissue in the inner part of the organ.

After fifteen, eighteen, and twenty-four days there was an extension of the process. The gland seemed surrounded by tubercular tissue that ceased at the capsule. The capsule was thickened, and the medullary substance was connected to the outer tissue by the connective tissue representing the wound tract. This tract showed epithelioid giant cells and occasional nodules of caseation. The tissue proper of the gland seemed as yet normal. The cortical substance showed its three layers distinctly, and after two months it still presented a normal appearance, although the medulla was only a caseous mass. At about three months the cortical substance began to be involved, showing many openings, with great proliferation of the connective tissue. Even after four months the cortical substance still showed resistance.

In examining the nervous system he found marked alteration in the cells of the cerebrum, affecting chiefly the nuclei, while in the cerebellum the protoplasm was chiefly involved. Changes were found also in the cells of the basal nuclei, in the ganglion cells of the pons and medulla, and in the cervical, dorsal, and lumbar portions of the cord. In the cord the changes were most marked in the dorsal region. The intervertebral ganglia were unaltered, and no changes were found in the

white matter of the nervous system. No changes were found in the sympathetics.

The heart showed cloudy swelling and fatty degeneration, as did the liver and kidneys.

Fifteen to thirty days after operation the animals showed changes in the spleen and bone-marrow. At the same time the blood contained nucleated red cells and many eosinophiles (polymorphonuclear).

After forty days there was slightly more blood, and the marrow and spleen were normal.

The skin showed no evidence of pigmentation. In one-sided operations no change was found in the opposite suprarenal.

De Veechi concludes that through tubercular inoculation of the suprarenals there is produced a severe general intoxication that leads to death of the animal.

The poison circulating in the blood has a special affinity for the gray substance of the central nervous system, and in this way the nervous symptoms of the disease may be explained.

The lesions usually found in the sympathetics in human autopsies in Addison's disease are the result of a long-continued action of the malady. He quotes Brauer,¹ who found changes in the abdominal ganglia in phthisis. That they were not found in the rabbit was because the disease had not lasted long enough.

Failure of pigmentation may be explained by the fact that small portions of the cortical substance were found in each animal, and possibly these were still functioning. He believes that sympathetic involvement has nothing to do with pigmentation, for in one of his cases there was direct extension of the cardiac ganglion, and this case differed in no particular from the others. He quotes a number of cases of autopsies on Addison's disease where the sympathetics were not affected, yet the bronzing was present.

He thinks that typical Addison's disease is the sum of two factors—insufficiency of the suprarenals plus the intoxication produced by the tuberculous process that has developed in the organ. This theory explains why almost all typical cases of Addison's disease show caseation of the suprarenals, while tumors which destroy these organs give rather the symptoms of suprarenal insufficiency.

J. V. Shoemaker² reports the case of a patient, aged nineteen years. No definite history could be elicited. He belonged to a tuberculous family, his mother dying of pulmonary tuberculosis when the patient was a year old. Ten days before admission to the hospital there had

¹ *Deutsche Zeitschrift f. Nervenheilkunde*, November, 1894, Band vii.

² *Journal of American Medical Association*, March 23, 1901.

been an attack of nausea and vomiting. He complained of lumbar and abdominal pains, and was decidedly nervous. Strength was not impaired. The face was of a bronze color, having been that way for a year. The discoloration first appeared in blotches, which later became confluent. The hands and forearms were discolored in a similar manner. The trunk and lower limbs were of a deep yellow color. Small purplish spots were noted on the mucous membrane of the mouth. There was some cough. Urine and sputum examination negative.

The patient was first seen November 11, 1898. He was then given suprarenal extract, 5 grains, twice daily, the dose being gradually increased. Improvement took place for three and a half months, when he was suddenly seized with pain in the left epigastric region, extending around to the back. There was at the same time incessant vomiting, aggravated by food. The patient died on the third day following the attack.

At autopsy the body appeared emaciated and showed bronze-colored areas of discoloration. The apices of both lungs showed old tubercular lesions. The other organs in the chest showed nothing of note except the small size of the heart, which was less than normal. The suprarenals were slightly enlarged, and on section caseous areas were found. The lymph glands of the mesentery were also enlarged and showed caseous degeneration.

Shoemaker advises suprarenal extract in these cases, believing that it supplies the necessary elements to the body. He thinks that in cases of atrophy, sclerosis, or inflammatory changes, in which portions of the gland are still functioning, the administration of suprarenal extract is most serviceable.

L. Huisseau¹ showed a specimen of double suprarenal tuberculosis from a case of Addison's disease in a girl, aged twenty years. He repeated his former statement as to the function of the suprarenals founded on this case, and five others reported in November, 1900. The task of the normal suprarenal is in attracting to itself certain toxic products originating from intestinal decomposition (*e. g.*, benz katechin) and from muscle action (*e. g.*, phosphoric and lactic acids), rendering them harmless and preparing them for excretion by the kidneys. He calls attention to the importance of Marchand's accessory adrenals in case they are present.

¹ Münchener med. Wochenschrift, April, 1901, No. 16.

OPHTHALMOLOGY.

BY EDWARD JACKSON, M.D.

DISEASES OF THE CONJUNCTIVA.

Ophthalmia Neonatorum. The difficulty of bringing into true relations the recently discovered facts of the bacteriology of the conjunctiva and the older clinical observations is illustrated in the recent literature of this disease.

To demonstrate that a certain micro-organism causes a disease is one thing. To readjust our classification of cases in harmony with this fact is quite another. The old classification by general clinical features was fairly definite. The term "purulent ophthalmia of the newborn" had a fairly exact clinical significance. It was natural, upon the discovery of the gonococcus, to ascribe to it the whole class of cases of ophthalmia neonatorum. But a further acquaintance with the subject shows this was an error. This is strongly urged by A. Alt,¹ who has found the gonococcus in but 9 out of 14 cases. The purulent ophthalmias of the newborn, using the term to describe the familiar clinical picture, are not all caused by the gonococcus; and, on the other hand, gonococcus diseases of the conjunctiva in infants do not always assume the clinical form of purulent ophthalmia.

This has been indicated by numerous observations in former years, and is still more definitely shown by Groenouw. From the eye clinic of Breslau he reports² a clinical and bacteriological study of 100 cases, including with the purulent ophthalmias slighter inflammations of the conjunctiva in the newborn. In his series severe purulent inflammations, or simple conjunctival catarrh, were caused by either the gonococcus, pneumococcus, streptococcus pyogenes, colon bacillus, and perhaps the staphylococcus aureus. He found that in the same patient gonococcus disease of one eye might take the form of a purulent ophthalmia, while in the other its manifestation was a simple catarrh.

But it must not be thought from this that the micro-organism present in a particular case is a matter of little importance. Groenouw also found that the more severe and intractable inflammations were usually

¹ American Journal of Ophthalmology, April, 1901.

² Graefe's Archiv f. Ophthalmologie, Band lii., Heft 1.

due to the gonococcus; and that it was the gonococcus disease, whether manifestly severe or apparently more mild, that threatened the integrity of the cornea. Indeed, he is convinced that if a single careful examination of a cover-glass preparation of the discharge, taken before treatment or long enough after any antiseptic application to allow the reappearance of an organism, when such an observation fails to show the gonococcus, a favorable prognosis is always justified.

To the cases of ophthalmia neonatorum existing at birth a striking one is added by Strzeminski.¹ The child was born a few minutes after the rupture of the membranes, after a labor lasting thirteen hours. Strzeminski thinks his cases show that the gonococcus can penetrate the fetal membranes while still intact.

With regard to the treatment, Groenouw's experience is distinctly favorable to protargol. He found that a 5 per cent. solution of this drug caused the disappearance of the gonococcus from the discharges quite as soon as the use of a 2 per cent. solution of silver nitrate.

Groenouw's paper, while the most important of the year upon the subject, does not stand alone in its conclusions. F. Schanz² finds that in the majority of cases ophthalmia neonatorum is not due to the gonococcus.

With regard to the value of protargol, Piotrowski³ reports upon its use in a 10 per cent. solution with a strong solution of boric acid for the prevention of this disease; that in over 1000 children treated with these solutions not one developed any marked ophthalmia, and catarrhal conjunctivitis occurred in but 1.02 per cent. J. L. Hiers⁴ thinks protargol reliable, safe, and quick in the therapeutics of ophthalmia neonatorum, and that it should be substituted for silver nitrate as a prophylactic.

Gonorrhœal Ophthalmia. It is still quite uncertain what are the important factors causing destruction of the cornea by purulent conjunctivitis. Pressure interfering with the circulation, and thus with the nutrition of the cornea, has long been regarded as one of the most important. If this were really the case, it would be fair to expect the centre of the cornea to break down first. But in my experience the corneal lesion has been more frequently first noted near the margin, where infective discharges are retained in contact with the cornea in the groove formed by the swelling of the adjoining conjunctiva.

A. E. Bulson⁵ reported some cases in which incision of the lids, to

¹ *Recueil d'Ophthalmologie*, December, 1901.

² *Zeitschrift f. Augenheilkunde*, June, 1901.

³ *Centralblatt f. Gynäkologie*, August 3, 1901.

⁴ *Georgia Journal of Medicine and Surgery*, January, 1902.

⁵ *Ophthalmic Record*, April, 1901.

relieve the pressure caused by their swelling, seemed to help in saving the threatened cornea. In discussing Bulson's paper, Hotz, Montgomery, Westcott, and Fiske took the view that pressure of the lids had little effect upon the corneal nutrition; but C. W. Hawley reported a case in which such pressure seemed to determine the occurrence of corneal ulceration. Severe chemosis, since it involves more direct pressure on the pericorneal zone, may be more reasonably expected to disturb the corneal nutrition, so that its relief by scarification is more important than relief from pressure of the lids by canthotomy or division of the upper lid near the middle. Division of the lids, or canthotomy, however, may still be a valuable procedure, because it permits the more thorough cleansing of the conjunctiva. In the above discussion the value of irrigations, with a solution of potassium permanganate, was urged by Wilder, Hale, Snyderacker, and Gamble.

Trachoma. For this disease "much can be done in the way of prevention, but in too many cases little can be done in the way of cure," says W. H. Wilder,¹ in an article on the prevalence of trachoma in the State of Illinois. That crowding and deficient ventilation may favor the spread of disease is continually forced on the attention of those who see the cases of trachoma in orphan asylums and in the dispensaries of our seaport cities, where it has been contracted in the steerage passage across the ocean. But it is a fact even more significant that this disease is extremely common among the rural populations of the Mississippi Valley. Wilder's study is based on the statistics of the Illinois Charitable Eye and Ear Infirmary from 1890 to 1900. This institution, situated in Chicago, has been a State institution since 1874, and attracts the more chronic severe cases of eye disease from the whole State. It would naturally be expected to draw a larger proportion of cases from the region around Chicago; but the fact is that more cases of trachoma come from the distant counties, the largest proportion being furnished by the southeastern part of Illinois. Thus from Cook County, in which Chicago is situated, the number of cases of trachoma is only 13 in 100,000 population, while from Jasper County, 200 miles away, it is 382 per 100,000. Even Alexander, the most distant county in the State, furnishes 185 per 100,000. These statistics show clearly that the disease is more common and more destructive in regions removed from centres of population. The reason for this Wilder states thus: "In some sparsely populated country districts the habit of personal cleanliness has never been formed or even conceived, judging from the class of people that I frequently see from such localities. A bath-tub is an unknown contrivance, and the basin and hand towel used

¹ Ophthalmic Record, November, 1901.

in common by the whole family are the only substitutes. It is safe to say that this is one of the diseases of filth, and, given the infective element, that it flourishes in those surroundings where people are intimately associated and where the simplest principle of hygiene, personal cleanliness, is neglected."

He points out that it is certainly the duty of the medical profession to enlighten the community on this subject. We have no proof that trachoma develops sporadically, and even if it may do so, the mass of cases certainly arise by contagion. Yet it is not virulently contagious, and may fail to secure a foothold by repeated inoculations; while only eyes that are discharging are actually dangerous. An important point brought out by Wilder is that the disease has become more common in the last ten years, and that in the Illinois Institution for the Blind over 9 per cent. of the patients are admitted for the consequences of trachoma.

The etiology of trachoma in Egypt has been studied by Morax and Lakah¹ in a way to bring out some very important points. The prevalence of the disease in that country has been referred to in support of various theories regarding the causation of trachoma, especially as indicating race idiosyncrasy and the importance of climatic conditions. Bearing upon the factor of race predisposition is their study of the disease in one of the institutions of Alexandria, where abandoned infants of European parents are placed with native nurses, and up to the age of two years live under the same conditions as the bulk of the Egyptian population. Among 63 of these nurslings 14 were found suffering from trachoma. The nurses who had charge of them were examined; 8 showed active conjunctival lesions of trachoma, and 5 showed scars of earlier disease. Only 1 was exempt. It was improbable that infection had occurred from the nurses presenting cicatricial lesions. Therefore the surroundings of these 6 infants were further investigated, and in every case active trachoma was discovered among the most intimate associates of the children. Here, although any race predisposition was excluded, the proportion of cases of trachoma reached 22 per cent. before the children were two years of age. The investigation was continued among the older children. Among 75 between two and twelve years of age there were 56 cases of trachoma, or 74 per cent. Among 20 between the ages of twelve and seventeen 7 presented typical trachoma granules, and 13 had older cicatricial lesions of the conjunctiva. All had suffered from trachoma.

The children were examined in a number of schools in the city and the proportion of cases was found to vary between 20 and 100 per

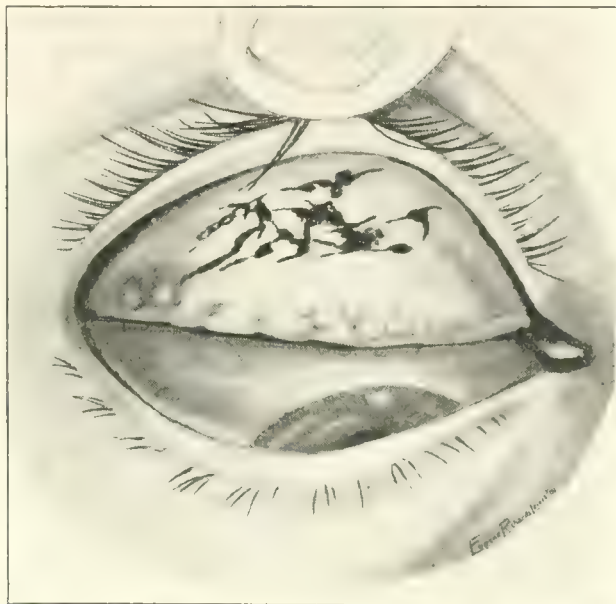
¹ *Annales d'Oculistique*, November, 1901.

cent. Among 387 children 75 per cent. had suffered from trachoma. These authors conclude that the prevalence of trachoma in Egypt is due to the fact that infection occurs in many children from the nurses before weaning, and in most of the others during school life.

L. de Wecker¹ urges that the above writers have underestimated the importance of climate. He points out that the eye is made receptive of the trachoma virus by acute conjunctival inflammations, and that exposure to irritants increases the discharge in which the virus is spread.

Statistical studies like these have far greater value in determining the causes of trachoma than any amount of general theorizing or the limited experience of any one ophthalmologist, however carefully re-

FIG. 25.



corded. They seem to show that what is known to be true of the crowded emigrant ships, schools, and orphan asylums is true also of the family life in whole regions or countries; that trachoma is spread by contagion, by the personal contact of those who have never learned the civilized standards for cleanliness. The disease illustrates the fact that with the establishment of fixed abodes and closer personal contact certain hygienic measures become absolutely essential. However primitive the manner of living may be in some respects, certain rules of hygiene must be observed in the home as well as in the school or orphan asylum.

The contagiousness of trachoma is so easily prevented by treatment that the practical stamping out of the disease might readily be accomplished. The rarity of it about the larger towns and cities of Illinois, as com-

¹ *Annales d'Oculistique*, January, 1902.

pared with its frequency in more remote districts, illustrates the importance of treatment in preventing contagion, as well as in effecting a relative cure. The same thing is illustrated by statistics of trachoma in schools in Amsterdam, reported by Straub.¹ In one school the percentage was reduced from 76 per cent. in 1881 to 14 per cent. in 1897.

PIGMENTATION OF THE CONJUNCTIVA. In the course of trachoma in the Malay race, L. Steiner² states that this is a frequent and striking phenomenon. They most frequently appear on the upper lid as shown in Fig. 25. The pigment is situated in the deepest layers of the epithelium. Similar spots have been noticed in the Chinese.

THE TREATMENT OF TRACHOMA was discussed at the New York Academy of Medicine, the discussion being opened by a paper from T. R. Pooley.³ He found that of mechanical methods expression of the contents of the granules was the most efficient and did the least damage to the conjunctiva. It must, however, be followed by local applications, and in any case there was a strong tendency to relapse.

Those who joined in the discussion agreed in the main with these views. Very much the same conclusion is reached by S. Cetnarorvicz,⁴ who, after a general review of the subject, concludes that repeated applications of copper sulphate crystal, and silver nitrate solutions, with expression by the Knapp forceps, is still the best treatment for trachoma.

The method of treatment by metallic electrodes has, from time to time, been urged on theoretical grounds. J. G. Huisinga⁵ again advocates it as "followed by very gratifying results" in all light forms and acute conditions and in all follicular conjunctivitis, which he believes an early manifestation of trachoma. He uses a flat electrode made of pure silver or copper attached to the positive pole. This is pushed up into the upper fornix and the current gradually turned on until it reaches 5 milliamperes. The electrode must be kept constantly in motion to prevent adhesion to the conjunctiva. The current is passed for five or ten minutes, causing, with the copper, a greenish tint from deposition of its salts in the tissues. This application is to be repeated once or twice a week.

Very excellent results are reported by R. D. Sleight⁶ from the treatment of trachoma with mercuriol. He commenced by using solutions, but with further experience came to employ the powdered drug, which was applied with a camel's-hair brush, or a probe wrapped in cotton,

¹ *Klinische Monatsbl. f. Augenheilkunde*, March, 1901.

² *Annals of Ophthalmology*, January, 1902.

³ *Archives of Ophthalmology*, vol. xxx., No. 1.

⁴ *La Clinique Ophtalmologique*, September 25, 1901.

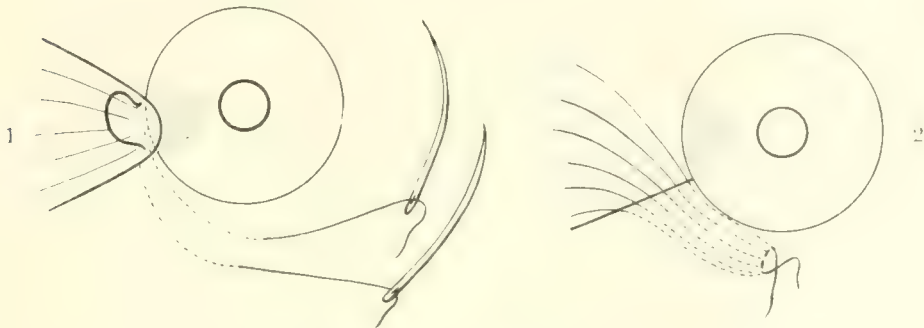
⁵ *American Medicine*, November 16, 1901.

⁶ *Therapeutic Gazette*, April 15, 1901.

directly to the everted lids. It first renders the mucous membrane yellow and then red, when it should be washed off with normal salt solution or a solution of boric acid. Trial of mercuriol for this purpose convinces me that it has decided value, possibly greater value than that of any other drug for the treatment of trachoma.

Pterygium. The operation of transplantation has always been favored by a certain number of surgeons. A modification of it which seems to offer distinct advantages over methods previously in use is suggested by J. O. McReynolds.¹ He grasps the pterygium where it crosses the corneal margin and carefully dissects up the corneal portion. Then, with straight scissors, he makes an incision along the lower border of the conjunctival part of the pterygium extending 6 to 12 millimetres from the corneal margin. No incision is made along the upper

FIG. 26.



McReynolds' operation for pterygium.

1. Suture introduced. 2. Pterygium drawn into its new position.

border of the conjunctival part of the pterygium. This part is then carefully dissected up from the sclera, with any small non-cutting instrument.

The conjunctiva below the incision is also carefully separated from the sclera. Then a thread armed at each end with a small needle is passed through the free end of the pterygium, both needles are carried down beneath the conjunctiva, and brought out through the lower fornix 3 to 6 millimetres apart. The loosened conjunctiva is then raised and the free portion of the pterygium drawn under it by traction on the ends of the thread. The tightening of the ligatures holds the growth firmly in its new position and leaves in its former position along the corneal margin smooth, stretched conjunctiva. Both the growth and the conjunctival incision are covered by the lower lid, and it is claimed that the result has never disappointed the operator.

¹ Ophthalmic Record, May, 1901.

DISEASES OF THE CORNEA.

Aspergillus Keratitis. This is a rare disease, and one the true character of which might readily be overlooked, the case being regarded as one of foreign body with corneal ulceration. J. M. Ball¹ believes that it is more common than has heretofore been supposed by writers on ophthalmology. He reports a case and mentions a general practitioner who had met with seven cases of the kind. Ball's case was a farmer who had suffered six weeks with painful inflammation of his eye. The cornea presented an ulcer with comparatively clean edges, at the bottom of which lay a soft ovoid mass 2 millimetres in its longest diameter. This mass was found to consist largely of mycelial threads of yellowish-brown color. These ramified in all directions and were divided by septa into cells that have a tendency in the outer layer to assume a globular shape. The sporangia were not matured. The treatment for this condition is the prompt removal of the mass which the growth forms, and which may have the appearance of a foreign body. The case reported by Ball came from the region in which the other cases to which he refers had been noted. In previously reported cases the cultures made have shown only *aspergillus fumigatus*, and the color of the mass has been white.

Chronic Creeping Ulcer of the Cornea. To the form of chronic corneal ulcer first recognized as a special type by Mooren, and to which he applied the name *ulcus rodens*, Nettleship² would give the name chronic serpiginous ulcer. He thinks the term "rodent" should be reserved for the particular form of epitheliomatous ulcer involving the skin to which it is commonly applied. He has encountered twelve cases—a large number to fall under the observation of any one ophthalmic surgeon. The beginning of the disease has been seen in rare cases in a crescent infiltration or loss of epithelium just within the limbus. It spreads slowly in various directions and, unless checked, comes to involve the whole cornea, leaving it thin and partly opaque. It rarely perforates, nor is it often attended with hypopyon; but iritis is common. It advances by an overhanging edge, but may remain stationary for days or months. Nettleship places its usual duration at four to twelve months.

In more than 25 per cent. of cases both eyes have been attacked; but the majority of eyes are not lost, although greatly damaged. Nettleship states that the cause of the disease is unknown, but E. Andrade

¹ American Medicine, July 6, 1901.

² Transactions of the Ophthalmological Society of the United Kingdom, November 8, 1901.

reports two cases (translated by S. M. Burnett),¹ in which, from cultures made from tissue bordering on the ulcer, he obtained a bacillus somewhat like the colon bacillus, the single rods uniting to form chains. It had great motility, reproduced by round spores formed in the ends of the rods, colored by the method of Gram and other common stains, and grew best in blood serum. Inoculation into the anterior chamber of the rabbit produced no effect; but infection of the abraded surfaces of the cornea produced a keratitis, and left behind it some opacity.

The treatment recommended by Nettleship, and practised successfully by Andrade, was the removal of the overhanging and diseased tissue and a thorough cauterization of the affected area. This is also recommended by Schmidt Rimpler,² who, in addition, has drawn in the conjunctiva to cover the part thus denuded.

Atheromatous Ulcer. Under the name *ulcus atheromatosis*, or separating scar-keratitis, E. Fuchs³ discusses a form of inflammation seen in chronic scars of the cornea and anterior staphyloma, and characterized by the throwing off of hyaline masses or layers containing opacities composed of lime salts. The calcareous scales are to be found lying quite loose in the ulcer. When they come to involve the deeper layers of the cornea they may cause not only perforation, but also panophthalmitis. Fuchs finds the condition, whether affecting only the superficial layers or the deeper portions of the cornea, is essentially a necrosis of the badly-nourished scar tissue. The infection of the tissue by bacteria is permitted by the diseased condition of the epithelium. The necrotic portions separate and are thrown off by supuration, allowing the process to be repeated in the deeper layers.

Fuchs does not take up the treatment of the condition, but evidently little is to be hoped for in the way of successful permanent repair, and the dangers which attend the condition quite justify the removal of the diseased tissue either by abscission or by the enucleation of the eyeball.

Corneal Erosions. Under this name A. von Reuss⁴ and F. Schoeler⁵ discuss a condition that bears some resemblance to bullous keratitis, but in which the corneal epithelium is destroyed or cast off without being first raised up to form a bulla. The condition follows injury and may relapse. The treatment includes protection of the eye by a bandage, to which the use of cocaine to relieve the pain has been added. But the unfavorable effect that cocaine is known to exert upon the corneal epithelium should enforce great caution in its use for this purpose.

¹ American Journal of Ophthalmology, April, 1901.

² Archives of Ophthalmology, March, 1901.

³ Graefe's Archiv f. Ophthalmologie, Band liii., Heft 1.

⁴ Centralblatt f. praktische Augenheilkunde, March and April, 1901.

⁵ Ibid., June, 1901.

The treatment employed by de Schweinitz for relapsing *bullous keratitis* seems more rational. In three cases which he reports,¹ one of which was rather a case of erosion, since no bleb appeared, he employed applications of the actual cautery, massage with yellow oxide of mercury ointment, touching the erosion with silver nitrate, and cauterizing with tincture of iodine. As a local anæsthetic he employed holocaine, which certainly seems to be better suited to cases of this kind than cocaine.

Annular Keratitis. This condition was discussed last year.² E. Fuchs³ speaks of it as ring-shaped or disk-shaped, believing it essentially the same disease when the centre is opaque as when it is comparatively clear, leaving the opacity in the form of a ring. He finds the disease commonly occurs in middle life, and follows some lesion of the corneal epithelium.

Keratomalacia. The dependence of this condition upon impaired nutrition is generally recognized. Indeed, very young children affected by it commonly die. Treatment has been directed to improve nutrition, and yet the extremely simple plan resorted to by Baer is not referred to in most accounts of the disease, and has in his hands proved quite efficient. He reports⁴ four cases occurring in infants of two to seven months. In each case the clouding had occurred in one cornea or both; and the characteristic changes of epithelial xerosis were present. In these cases the family history was bad. Thus in the first case three preceding children of the same parents were all dead.

His plan of treatment was simply to change the child's diet. Instead of continuing to nurse it at the breast, milk and lime-water were substituted. In every case the general condition promptly improved, and the eye-disease was checked. Some eyes recovered entirely. Others were left permanently damaged. But in each case the child's life was saved, and such vision retained as it had at the time of commencing treatment.

Pigmentation of the Cornea. W. Stock⁵ reports a case of what he terms melanosis of the cornea, noticed in a patient aged sixty years. The patient was myopic, but had not suffered from noticeable disease of the eyes until recently incipient cataract had developed, and there was some haziness of the vitreous. In the deeper layers of both corneas was noticed a reddish-brown coloring. With the ophthalmoscope, using the concave mirror, this caused only a faint shadow; but with the plain mirror the opacity became more evident. With the

¹ Ophthalmic Record, December, 1901, p. 656.

² PROGRESSIVE MEDICINE, June, 1901

³ Klinische Monatsblätter f. Augenheilkunde, July, 1901.

⁴ Ibid., April, 1901.

⁵ Ibid., September, 1901.

binocular loupe it was resolved into red-brown points. The coloring was noticeable chiefly near the centre of the cornea.

Pigmentary deposits following inflammation with exudate into the cornea occur not very rarely, but in the above case a clear history of freedom from inflammatory disease was obtained. Stock regards the condition as congenital. This view is supported by the absence of any other evidence of inflammation and by the almost symmetrical arrangement of deposit in both eyes.

PUPIL AND IRIS.

The Pupil in Syphilis. In the extended discussion of reactions of the pupil last year, I referred to the conclusion of Harris, that loss of pupil contraction to light, the Argyll-Robertson symptom, may be considered an almost certain sign of syphilis. This view is taken by J. Nageotte,¹ in discussing the symptom in question. Babinski and Charpentier, who had previously called attention to this significance of the loss of light reflex, report additional observations to the same effect. They reported² four cases, showing no other signs of disease of the nervous system, in which the loss of light reflex occurred, with a history of syphilitic infection many years before. Within a few months I have encountered two cases of this kind. The patients were comparatively young, but the syphilis was of several years' standing. There were no other symptoms of organic nervous disease. Of course, it can be urged that other symptoms of locomotor ataxia may appear later. But, even with the liability to such a course, the loss of light reflex remains very significant.

Sulzer³ calls attention to the loss of associated reactions of the pupil as a transient symptom occurring comparatively early in the history of syphilis. Among fifty-three patients he found pupillary disturbances in fourteen. All of these patients were in the first year of the disease, and the majority in the third month. In twelve the disturbance was loss of light reaction. In one the light reaction was retained, but the pupil failed to contract with convergence. In the other case the pupil was dilated and fixed, although accommodation was not affected. The duration of these pupillary disturbances was from four to six weeks.

Iritis. That iritis depends upon constitutional causes is a fact of which each case encountered will be a reminder. It is probable, however, that even with this in mind our investigations into its causation

¹ *La Presse Médicale*, December 4, 1901.

² *Annales d'Oculistique*, July, 1901, p. 59.

³ *Annales de Dermatologie*, March, 1901.

are apt to be along too narrow lines—simply an inquiry for evidences of syphilis or rheumatism. Other dyscrasie, although less common, may still be essential causes of iritis. R. Batten¹ recently reported a case of serous iritis with persistent tachycardia. The pulse-rate ran from 104 to 140. In discussing this case G. A. Critchett referred to two cases he had seen in which serous iritis was associated with Graves' disease.

DISEASES OF THE CHOROID.

Purulent Choroiditis. This disease arises either from obvious purulent inflammation about the eye itself, from metastasis, or from direct injury. J. T. Carpenter² reports a case supposed to be due to mumps, until the examination of the enucleated eyeball showed that it had started from a small piece of iron that had entered with so little disturbance as to cause the patient to ignore the injury.

Metastatic Choroiditis. A remarkable series of six cases of this condition occurring in the course of pneumonia due to grippe, in two of which autopsies were obtained, is reported by C. S. Bull.³ These cases are still more remarkable from the fact that in six of the nine eyes which became affected it was possible to make a careful ophthalmoscopic examination after the choroid became involved and before the clouding of the media had advanced sufficiently to prevent a good view of the fundus. In three of the cases both eyes were involved. Two patients survived and were seen with vitreous opacity and lowered tension of the eyeball several weeks and months after the occurrence of the attack. In the others the pneumonia was fatal.

The ophthalmoscopic appearances first seen were those of limited areas of swollen yellow choroid, which rapidly extended. In a few hours the vitreous became clouded so as to obscure them. Sometimes these foci of disease were multiple from the start, as many as four distinct patches being seen at the first examination, and in a few hours the whole fundus gave the characteristic yellow reflex. The course of the disease was very rapid; thus in an eye which at first presented three small foci of infection, with clear media and normal iris, the next morning the whole choroid was infiltrated and the vitreous slightly clouded at its posterior part, while marked ciliary infection had occurred. In the other eye of this same patient the symptoms seemed to start in both iris and choroid, and by the fourth day there was no perception of light in either, and in the eye first mentioned the sclera was perforated.

¹ Transactions of the Ophthalmological Society of the United Kingdom, May 2, 1901.

² Philadelphia Medical Journal, May 11, 1901.

³ Transactions of the American Ophthalmological Society, 1901, p. 316.

In the two cases in which the eyeball was examined after death all parts of it except the lens were found filled with pus cells. Numerous veins and arteries in the retina, choroid, and sclera were plugged with emboli, and the retina was greatly disorganized, the junction of the choroid and retina being obliterated. *Staphylococcus aureus* and the streptococci were found in large numbers in all the tissues. In one of the cases the pneumococcus was also found, but this is not mentioned as being present in the other case.

The ocular involvement, which occurred from three to six days after the development of pneumonia, was characterized by pain in the eye and head, intense congestion of the eyeball, with rapid and total loss of sight. The ocular tension was at first increased, but subsequently sank below the normal if the patient survived more than a very few days. The prognosis is always bad, total blindness occurring in all cases. Enucleation, Bull considers not advisable; but evisceration would often give relief from the severe pain.

That such an experience is altogether exceptional is shown by the discussion upon Bull's paper. Dr. Knapp spoke of it as adding a new disease in which metastatic choroiditis might develop. It is likely, however, that some of the previously reported cases of panophthalmitis occurring in connection with pneumonia have really been consequences of grippe.

Metastatic Panophthalmitis has more frequently been reported as a complication of puerperal fever. W. L. Pyle¹ bases a careful review of the subject upon a single case which he has encountered, and in the discussion of his paper another ophthalmologist of wide experience says he has seen but a single case. This is a great change from the time, between 1850 and 1870, when Schöbl says that in the wards at Prague he saw as many as four or five of these cases daily. Pyle's case was seen late—two months after its beginning—and the affected eye enucleated. The microscopical examination of it showed simply a late stage of the process described by Bull.

Metastatic panophthalmitis is commonly associated with such grave general disease that the eye lesions are liable to be neglected. But in a case which I have recently reported² the eye symptoms overshadowed all others, and the recognition of their character and significance led to an appreciation of the gravity of the patient's general condition, which was not evident from any other symptoms.

For the treatment of panophthalmitis L. Dor³ supports certain measures upon the ground of experiment. Using the delicate test

¹ Proceedings of the Philadelphia County Medical Society, March 13, 1901.

² Transactions of the American Ophthalmological Society, 1901, p. 335.

³ *Revue Générale d'Ophtalmologie*, June, 1901.

afforded by phenolphthaline, he found that the reaction of the normal vitreous is usually distinctly acid; but in eyes recovering from severe inflammation it is much less acid. Believing that this diminution of acidity was designed to aid the tissues in the struggle with pyogenic bacteria, he endeavored to produce a comparative alkalinity of the vitreous by the administration of large doses of alkalies, and with still greater success by the use of potassium iodide. Experimenting on rabbits, he found that in this way he could prevent inflammation from an inoculation of *staphylococcus pyogenes* which would otherwise cause a panophthalmitis.

This fact, he urges, may be utilized in preventing serious consequences from infection by foreign bodies or by operative penetration of the vitreous. Such measures would, however, be quite impotent if directed against a process such as Bull describes, in which the choroid becomes first affected with extensive thrombosis, and the vitreous involvement comes later, and in which the violence of the process is such as to probably preclude benefit from any practical treatment.

Sympathetic Disease. The better understanding of this somewhat mysterious class of diseases must depend upon more exact diagnosis. It is well established that we have under this heading two distinct classes of cases, and yet the confusion of the one class with the other is still very common. For instance, Guibert,¹ under the general title of "Sympathetic Ophthalmia," reports four quite dissimilar cases. One was of iritis, occurring as a sequel to typhoid fever, the other eye having been blind for thirty years from injury. His second case was one of optic neuritis following an attack of grippe, one eye having been lost thirty years before. The third case presented some symptoms of sympathetic irritation after an attack of grippe, the accused eye having been shrunken for fourteen years. The fourth case was one of doubtful sympathetic irritation.

The admission of such reports to the columns of the best ophthalmic journals is so certain to perpetuate the confusion of totally different diseases that it deserves severe criticism. It should be understood that sympathetic ophthalmitis is a distinct condition with certain characteristic symptoms, and no case should be reported as belonging to this class in which all or the most of these symptoms were wanting.

The confusion complained of is not merely a matter of classification or scientific interest. It is of the greatest practical importance. I have recently reported² three cases in which the removal of the injured eye had been strongly insisted upon without what seemed to me suffi-

¹ *La Clinique Ophtalmologique*, March 25, 1901.

² *American Journal of Ophthalmology*, May, 1901.

cient reason, and in which the subsequent history proved that such removal was unnecessary. From one of these eyes I have since extracted a cataract, obtaining 4/9 vision. This eye had been condemned to removal by three teachers of ophthalmology, because there was a history of injury, and the other eye was suffering from inflammation of the uveal tract, which ultimately destroyed its usefulness. But beyond this the case presented little in common with sympathetic disease.

The diagnosis of sympathetic disease will be difficult enough, even when all necessary confusion has been avoided. Sympathy may be suggested as a factor in most diseases that tend to affect both eyes. Grosz¹ reports a case of tuberculosis of the uveal tract simulating sympathetic inflammation, in which the diagnosis was only made with the microscope after the supposed exciting eye had been enucleated. T. Zuhone² reports a case of iritis with retinal hemorrhages three months after enucleation of a shrunken eye. But he does not call it a case of sympathetic ophthalmia.

SYMPATHETIC IRRITATION This is the condition which is likely to arise from eyes that have been injured several years previously. Any eyeball which has undergone extensive degenerative changes, whether following injury or not, may give rise to it.

Ossification of the choroid is particularly likely to cause sympathetic irritation. D. Webster³ reports a case of this kind. The exciting eye had not been wounded, but had been the seat of severe inflammation, followed by shrinking of the eyeball more than twenty years before. Another case is reported by G. S. Dixon⁴ in which the exciting eye had received a perforating wound seven years before.

In these cases removal of the exciting eye produced a prompt cure of the condition, as it always does. The fact that sympathetic irritation can be cured in this way renders prophylactic enucleation unnecessary and unjustifiable so far as this form of sympathetic disease is concerned.

SYMPATHETIC INFLAMMATION. It is because sympathetic ophthalmitis is not always curable by removal of the exciting eye, or by any other means at our command, that prophylactic enucleation is justified and imperatively demanded when it is threatened.

In spite of what has thus far been written, and in spite of the popular belief in the connection of disease of one eye with disease or injury of the other, cases of this kind are still not rare. A. Alberte⁵ reports from

¹ *Annales d'Oculistique*, March, 1901.

² *Annals of Ophthalmology*, January, 1902, p. 104.

³ *Archives of Ophthalmology*, January, 1901.

⁴ *New York Eye and Ear Infirmary Reports*, 1901.

⁵ *Beiträge zur Augenheilkunde*, Heft 47.

Heidelberg Clinic 14 cases occurring among less than 10,000 patients. He properly lays chief stress upon prophylaxis, but finds this treatment of value: Early enucleation of the exciting eye, mercurial inunctions, potassium iodide, salicylates, and diaphoresis, with the local use of atropine and warm applications. A case of sympathetic ophthalmitis watched for six years and through three relapses is reported by A. Darier.¹ In spite of a glaucomatous outbreak treated by iridectomy, vision = 2/3 was still retained. The main reliance had been placed on mercurials, and especially injections behind the eyeball of solutions of the cyanide, 1 : 1000 and 1 : 500, in large amounts—"a syringe-ful."

S. Ruge,² from an anatomical study of the stumps left by such operations, urges that exenteration and the operations based upon it, as the Mules operation, do not include complete removal of the uveal tract, which is necessary to render them of the greatest prophylactic value. At best, the equivalence of exenteration to removal of the whole eyeball must be regarded as doubtful. Until we know more definitely the manner in which the disease process extends from the exciting to the sympathetic eye this uncertainty will probably remain. The bacterial theory of this disease, promising as it seems to be, still lacks any substantial basis of observed facts. Grunert³ reports a careful anatomical and bacteriological investigation of another case in which the results bacteriologically were negative.

Sympathetic inflammation is not expected to follow panophthalmitis, but F. Fisher⁴ reports a case in which this sequence occurred after cataract extraction. The extra-ocular complications of this disease are discussed by L. de Wecker,⁵ who adds one to the few reported cases in which deafness attended the eye lesions without any other evident cause. Such cases, while of practical value in certain directions, do not aid in understanding the nature of sympathetic ophthalmitis, and are very liable to lead to an indefinite conception of the character of the disease. The explanation offered regarding them is through an infective process involving the base of the brain as it extends to the second eye. But there are grave difficulties in the way of accepting such an hypothesis.

DISEASES OF THE RETINA.

Syphilitic Retinitis. This is a condition more frequently mentioned than seen; and yet it undoubtedly occurs, and is of very great interest from the point of view of the pathologist as well as from that of the

¹ La Clinique Ophthalmologique, February 10, 1902.

² Graefe's Archiv f. Ophthalmologie, Band lii., Heft 2.

³ Klinische Monatsblätter f. Augenheilkunde, November, 1901.

⁴ Ophthalmic Record, April, 1901, p. 196.

⁵ Annales d'Oculistique, October, 1901.

ophthalmologist. H. Friedenwald¹ reports a case watched from an early stage throughout its course. It began nearly two years after the primary lesion and after the eyes had suffered from iritis and from slight choroiditis. At the height of the attack there was some vitreous opacity, a large white spot in the macula, and numerous white spots around it, with others arranged along some of the vessels; also a number of hemorrhages. One of the vessels appeared as a white line. Subsequently the spots all disappeared, and even the coat of the vessels above mentioned became normal in appearance. The disk was pale, but not decidedly atrophic.

Central vision improved to 20/60, but the field of vision remained permanently contracted in the lower portion in a way to indicate disturbance of the vascular supply. The improvement occurred under the administration of potassium iodide after a course of mercurials. The retinitis was confined to one eye—the one which had suffered least from the iritis. It has happened that in all cases of this disease that I have seen the lesions have been confined to one eye, or were much more severe in one eye than in the other. The tendency of syphilis to produce bilateral lesions gives little assistance in the diagnosis of this affection.

Friedenwald believes that in his case the retinal disease was quite independent of any choroidal lesion. When the white spots cleared up they left no disturbance of pigmentation. He also regards it as supporting the view that syphilitic retinitis is due to endovasculitis and perivasculitis. In view of the vascular nature of many of the syphilitic lesions of the brain, this mode of origin gives syphilitic retinitis an especial interest as a visible illustration, likely to throw light on the pathology of some of the most important diseases of the central nervous system.

Albuminuric Retinitis. The extremely grave prognosis of this affection refers rather to the indication it gives of failing powers and early dissolution than to the chances of blindness. If the patient could live long enough, and had more than the most meagre capacity for recuperation, there is every reason to suppose that the retinal lesions would end in comparative recovery. When life is prolonged it is not unusual to see particular lesions removed and vision partly restored. In the last year several cases have been reported in which recovery was more complete.

Rochon-Duvigneaud¹ reported two cases. One was of nephritis arising during pregnancy, in which at the end of the year the only remaining lesions were a pale disk and some alteration of pigment about

¹ Ophthalmic Record, August, 1901.

² *Revue Générale d'Ophthalmologie*, October, 1901.

the macula. There was no recurrence up to the time of the patient's death, eight years later. In the second case—that of a man who had suffered from acute nephritis—the same recovery occurred and six years later continued. E. Zirm¹ reports the case of a girl, aged fifteen years, who had suffered from intense swelling and opacity of the retina and reddening of the optic disk in connection with acute albuminuria, in which recovery was complete within four months.

A. R. Baker² reports two cases, one of which was under observation for fifteen years, the other for eleven years. In the first case the ophthalmoscopic lesions were typical, but under careful hygienic and dietetic management the patient recovered, and no trace of retinitis could be seen. In the second case the appearances were also typical, but in spite of the occasional appearance of albumin in the urine the patient continued in fair health, and recently had undergone a cataract extraction with satisfactory visual result.

G. G. Lewis³ reports a case in which retinal hemorrhage due to Bright's disease had occurred five years before, also followed by a cataract in one eye. Four years after this two hemorrhages occurred in the other eye. This subsequently, however, cleared up, leaving vision 18/15ths. Large amounts of albumin had been present in the urine from time to time, but under treatment and strict diet the patient's health remained excellent at the end of five years.

Albuminuric retinitis and uræmic amaurosis, as the two causes of blindness in connection with nephritis, are discussed by E. W. Clapp⁴ and W. H. H. Jessop.⁵ They point out the incomplete gradual impairment of vision of the former, as contrasted with the sudden blindness produced by uremia. The prognosis as regards life is very grave in both cases, but neither condition is likely to cause complete permanent blindness. Clapp, however, points out that repeated attacks of amaurosis may be followed by permanent blindness, with pallor of the optic disk; and this fact seems rather to indicate that the lesion causing such attacks is situated in the retina or optic nerve, although during the attack no ophthalmoscopic changes can be perceived.

The liability of albuminuric retinitis to be followed by glaucoma is illustrated again in a case studied by P. Römer.⁶ The eye was enucleated on account of absolute glaucoma and the retinal changes carefully studied. Great alterations in the vessels, with white opacities in the retina, were the most striking changes. The retinal opacities were

¹ Centralblatt f. praktische Augenheilkunde, March, 1901.

² Annals of Ophthalmology, July, 1901.

³ Loc. cit.

⁴ Boston Medical and Surgical Journal, July 11, 1901.

⁵ Practitioner, December, 1901.

⁶ Graefe's Archiv f. Ophthalmologie, Band lii., Heft 3.

arranged somewhat in the form of a wreath, including the optic nerve entrance and macula, as in circinate retinitis.

Vascular Disease. It is impossible to draw any sharp line between cases of albuminuric disease of the retina and cases of disease of the retinal vessels. The vessels are always greatly affected in albuminuric retinitis, and, as indicated by Friedenwald's case, in other forms of retinitis as well. This lesson is also enforced by a case reported by Hummelsheim and Professor Leber.¹ The patient suffered from diabetes mellitus, and died of cerebral apoplexy. His ocular lesions included atrophic changes in the retina and optic nerve, preceded by sudden impairment of vision, and the microscopical examination showed extreme endarteritis of the central artery of the retina and its branches.

EMBOLISM OF THE CENTRAL ARTERY. Two cases are reported by H. V. Würdemann² as cured by deep massage of the eyeball. This massage consisted in placing the ball of the thumb or the second finger upon the closed upper lid of the affected eye, and exerting forcible pressure upon the eyeball, with slow movement, for two minutes. In one case sight had been suddenly lost six days before, and the ophthalmoscopic picture was that of embolism. Immediately after the massage the eye could perceive light, the veins were less engorged, and the blood current had appeared in the arteries. The massage was applied twice daily for a week, at the end of which time the patient could see large objects; and a month later she had recovered full vision.

The other patient had been blind for three weeks, but had recovered some light perception a week before he was seen. Two weeks later vision had improved to 6/40, but the field was still greatly limited. The theory of such a course has been that the embolus became dislodged, broken up, and carried into the peripheral vessels, where it no longer interfered seriously with the nutrition of the retina.

Some of the best authenticated cases of embolism have occurred in connection with chorea, which is very generally accompanied with endocarditis. A new case of this kind is reported by H. Thomas.³ It ended in complete blindness, with optic atrophy and great contraction of the retinal arteries.

RETINAL THROMBOSIS. The whole question of embolism and thrombosis of the retinal vessels is still unsettled and enveloped in uncertainty.⁴ T. A. Woodruff⁵ reports a case as one of thrombosis of the retinal vein, in which the circulation had been re-established and

¹ Graefe's Archiv f. Ophthalmologie, Band lli., Heft 2.

² Annals of Ophthalmology, October, 1901.

³ Johns Hopkins Hospital Bulletin, October, 1901.

⁴ PROGRESSIVE MEDICINE, June, 1900.

⁵ Ophthalmic Record, January, 1902, p. 52.

vision improved from counting fingers at eighteen inches to 20/30. F. C. Hotz had a similar case, which regained full central vision, but with loss of the upper field. In both of these cases there was marked distention of the affected vein, and hemorrhages and other forms of exudate were noticed. I have recently seen a case in which recovery is said to be now complete, although the eye has not been examined since this occurred.

It is quite as easy to assume that the plug formed by a venous thrombosis might shrink, and by massage, or without it, be displaced and swept away into the general circulation, where it would occasion no inconvenience, as to suppose the displacement of an embolus. Such a fortunate result would be favored not only by massage, but also by medicinal treatment tending to improve the circulation and aid the absorption of the mass. Measures to restore the impaired circulation of the retina offer sufficient prospect of success to be worthy of trying carefully in all cases, without limiting them by any fixed theory of the pathology of the obstruction or the manner in which they bring relief.

Glioma of the Retina. It is difficult to recognize with absolute certainty the true character of a glioma or of the conditions that most nearly simulate it. The so-called pseudoglioma, due to a purulent accumulation in the vitreous, may often be recognized with a good deal of certainty from the history of preceding inflammation and a general illness which accounts for such an inflammation; but in rare cases conditions arise which give absolutely no distinguishing history, and the only wise course is to treat these cases as cases of glioma. G. E. de Schweinitz and E. A. Shumway report¹ such a case, in which the diagnosis of probable glioma, made by the former, was confirmed by Knapp; but upon enucleation it was found that the detached retina was thickened and had undergone extensive dropsical degeneration. If such a case were allowed to run its course the diagnosis could be made with great probability; but at the early stage, when enucleation is most certain to give a permanent cure in glioma, the diagnosis may be quite impossible.

The value of enucleation in glioma is illustrated by a new case reported by M. W. Zimmerman and B. K. Chance,² in which the child remained in perfect health five years after enucleation of the eye affected with glioma. La Grange³ also reports four additional cases as cured by enucleation.

As bearing on the nature of glioma, Brown Pusey⁴ has been able to stain sections, showing the rosettes, with Mallory's neuroglia stain, in

¹ Transactions of the American Ophthalmological Society, 1901.

² Annals of Ophthalmology, July, 1901.

³ Annales d'Oculistique, March, 1901.

⁴ Transactions of the Chicago Pathological Society, November 11, 1901.

such a way as to indicate that they take their origin from the neuroglia or from ependymal tissue, and not, as Flexner and Wintersteiner have supposed, from the neuro-epithelial layer. Certainly at present there is no preponderance of evidence for the neuro-epithelial origin of these tumors that would justify the giving up of the term glioma.

DISEASES OF THE OPTIC NERVE.

Optic Neuritis. Of late years the tendency has been to regard the condition of "choked disk" as not essentially different from "descending optic neuritis." In many cases of neuritis with organic disease of the brain the process is certainly not confined to the head-nerve, but is a true neuritis. Elschning¹ believes the inflammation is set up by the diffusion of toxins generated in the tumor or other cerebral lesion. Recently, however, there has been a revival or strengthening of the theory that choked disk is due to increased intracranial pressure. A. Hoche² points out that the optic nerve is not the only one which suffers degenerative changes from this cause. The posterior roots of the spinal nerves also give evidence of degeneration. This agrees with the fact that the pressure within the spinal canal is increased along with the pressure in the cranium. The choking of the spinal nerves seems to occur where the posterior roots pass through the pia mater—a point Hoche regards as analogous to the lamina cribrosa of the optic nerve.

The most important evidence of the dependence of choked disk upon intracranial pressure is furnished by the cases cured by reduction of intracranial pressure through trephining. Babinski³ reports a case of this kind. The increased intracranial pressure and choked disk followed a bicycle accident. After prolonged treatment had failed to give relief the opening of the cranium gave relief from all the symptoms except that the optic disks remained pale and visual acuteness slightly impaired. Another case is reported by Chesneau.⁴ In his case acuteness of vision had fallen to 1/20 and 1/15. The opening of the cranium permitted marked protrusion of brain substance, which slowly subsided, and vision was restored to 2/3 in each eye.

Optic neuritis following severe attacks of stone in the kidney, and others ascribed to uric acid, are reported by A. Zanotti.⁵ He considers the former due to auto-intoxication—a cause that must be invoked for some cases considered under the next head. In character, however,

¹ Wiener klinische Rundschau, January 19, 1902.

² Archives of Ophthalmology, January, 1901.

³ Annales d'Oculistique, March, 1901.

⁴ La Clinique Ophthalmologique, September 10, 1901.

⁵ Annales d'Oculistique, April, 1901.

these cases of neuritis belong with what has been described in this country as gouty inflammation of the optic nerve, retina, and choroid. The share of uric acid in causing such lesions is at least doubtful. The pathology of much that has been ascribed to uric acid is still to be determined, but that such lesions are closely associated with the lesions of other organs that are ascribed to this cause there can be no doubt.

The reaction of the pupil in recent optic neuritis, severe enough to cause blindness, is a very important symptom. J. Hirschberg¹ points out that when one eye is affected the covering of the sound eye causes the pupil of the other to dilate very widely; but if the blindness be incomplete or of very long standing no such dilatation will occur. As the blindness passes away or as the condition becomes chronic the symptom becomes less marked. Rapid improvement in the response of the pupil to light indicates speedy recovery of vision.

Retrobulbar Neuritis. There has been some disposition to regard all cases of this affection as toxic. Such a view is only tenable by regarding certain cases as due to auto-intoxications, about which very little is known. E. Swasey² reports a case in which first the left eye and then the right were involved. The patient was a healthy young woman, with no history of previous disease except grip and subacute rheumatism one year before. The optic nerve lesion was attended with headache, and the swelling of the disks was so great that it was at first ascribed to an intracranial growth. The subsequent complete recovery of vision and the continued good health of the patient seemed to demonstrate the character of the attack. The probable cause in this case was the mental and emotional disturbance from learning of the dangerous illness of her father. Double retrobulbar neuritis is reported by Lehmann.³ It occurred in a patient suffering from cancer of the stomach, who died six months later, and histological examination of the optic nerves showed evidence of an interstitial neuritis. A case in which both optic nerves were similarly affected from typhoid fever is reported by L. D. Brose.⁴ Recovery was complete in this case.

R. Jocqs⁵ reports two cases, one of which was due to lead-poisoning and the other occurred in a diabetic patient. E. Zirm⁶ reports a case of optic atrophy in connection with diabetes which quite likely followed a neuritis. Optic neuritis is reported by L. Gonzales⁷ as following the

¹ Berliner klinische Wochenschrift, November 25, 1901.

² Ophthalmic Record, March, 1901.

³ Centralblatt f. praktische Augenheilkunde, January, 1902.

⁴ New York Medical Journal, February 15, 1902.

⁵ La Clinique Ophthalmologique, July 25, 1901.

⁶ Centralblatt f. praktische Augenheilkunde, March, 1901.

⁷ Anales de Oftalmologia, March, 1901.

bite of a scorpion. The general symptoms of poisoning disappeared in a few hours; but the patient rapidly became blind, and next day showed serous effusion into the nerve-head and surrounding retina. Under diaphoretics and iodides vision returned and the fundus became normal.

The connection of retrobulbar neuritis with intranasal disease is discussed by D. T. Vail,¹ who finds it may occur in acute fulminating form from compression by the swollen walls of the sphenoid, may arise as a perineuritis from infection, or may be secondary to septic venous thrombosis.

TOXIC AMBLYOPIAS.

Methyl Alcohol Blindness. This form of toxic amblyopia continues to claim the largest share of attention in the literature of the past year. A. Birch-Hirschfeld² reports further experimental studies of the nature of the lesions causing blindness, and analyzes the symptoms of reported cases with reference to their indications as to its pathology. He finds that the first pathological changes are visible in the nerve cells of the retina, that the changes in the optic nerve occur subsequently, and that the degeneration of the optic nerve occurs with no evidence of any inflammatory process.

H. Friedenwald³ fed to rabbits various preparations of ethyl and methyl alcohols for a period of almost four months, the animals remaining in apparently good health. The effects produced were similar in all the animals. The retinal ganglion cells showed marked degeneration, and the inner and outer nuclear layers were less affected.

H. Gifford⁴ reports an additional case brought about by the drinking of cologne spirits made with methyl alcohol, which the patient had not thought of connecting with his sudden blindness. He was seen two days after the failure of vision commenced, and the ophthalmoscopic picture was absolutely negative. Gifford thinks that the absence of the slightest indication of haziness in the retina, which would be expected from a marked interference with the nutrition of the ganglion layer, is opposed to the view that the lesion is primarily retinal. He thinks that the subsequent atrophy of the optic disk is best accounted for by assuming a retrobulbar lesion of the optic nerve.

I have already suggested⁵ the possibility of both optic nerve and retina being affected. It is likely that the changes, so noticeable in the ganglion cell masses, occur at the same time in their processes

¹ American Journal of Ophthalmology, May, 1901.

² Graefe's Archiv Ophthalmologie, Band lii., Heft 2.

³ Johns Hopkins Hospital Bulletin, February and March, 1902.

⁴ Ophthalmic Record, July, 1901.

⁵ PROGRESSIVE MEDICINE, June, 1900.

the axis-cylinders of the nerve, and are attended with lesions of the supporting tissue. The symptoms described in some of the cases can hardly be explained without supposing early lesions of the nerve, but the weight of evidence seems to be that the impairment or destruction of the ganglion cells is the essential harm done in this form of poisoning.

Another case of blindness caused by methyl alcohol not taken into the stomach is reported by G. E. de Schweinitz.¹ It occurred in a man who had been working two months continuously at varnishing. He used "Columbian spirits" as the menstruum, and frequently washed off the varnish from his hands and arms with this form of wood alcohol. When obliged to varnish the inside of a closet or of furniture he became so confused that he "staggered like a drunken man," and for some time he noticed attacks of misty vision which came on in the evening and lasted for fifteen or twenty minutes. The history of the final attack was the usual history of methyl-alcohol blindness.

A case occurring after the drinking of a pint of wood alcohol is reported by Payne.² An additional case, in which the wood alcohol was taken in the shape of "extract of Jamaica ginger," is reported by A. D. McConachie.³ This case was seen two days after the beginning of blindness, when the ophthalmoscope revealed no symptoms except slight congestion of the veins. Wurdemann,⁴ who has also seen a case of amblyopia from inhalation of fumes, makes a careful analysis of the symptoms, and concludes: That with proof of exposure to poisoning by wood alcohol, followed by vertigo, nausea, vomiting, and mental disturbances, with sudden blindness, and not followed by the recovery common in alcohol or tobacco poisoning, the physician could be positive in stating that the blindness was due to methyl alcohol.

Alcohol and Tobacco Amblyopia. F. Van Fleet⁵ reports a case of sudden complete blindness from drinking a large amount of ethyl alcohol. The lesion was an acute retrobulbar neuritis. The blindness was at first complete, but at the end of six weeks vision had increased to 20/200 and 3/200.

The more common form of alcohol and tobacco amblyopia as it occurs in Cuba is the subject of a report by C. E. Finlay,⁶ who summarizes 92 cases, of which 5 are ascribed to alcohol alone, 31 to tobacco alone, and 56 to the use of both alcohol and tobacco. He finds that the alleged immunity of the Spanish race does not exist. Seventy-five of his cases occurred in Cuban or Spanish whites. He thinks that the small number of cases in the colored race is due to a smaller opportunity for indulgence and to failure to seek relief for moderate defects

¹ Ophthalmic Record, June, 1901.

² American Medicine, January 18, 1902.

³ Medical Record, January, 1902.

⁴ Ibid., December, 1901, p. 602.

⁵ Ibid., December, 21, 1901.

⁶ Archives of Ophthalmology, May, 1901.

of vision. In a few of his cases fever, exposure, and other causes may have helped to bring about the disease. He employed the usual treatment of total abstinence from alcohol and tobacco, with the internal administration of potassium iodide and strychnine. Under this treatment there was distinct improvement in 25 cases and arrest of the disease in 16. In 4 cases out of the 45 that were treated the vision continued to grow worse.

Three cases of this disease reported by W. Zentmayer¹ are of especial interest because of the detection of retinal hemorrhages with the ophthalmoscope. In every instance the hemorrhage was located at the disk or between it and the macula, in the tract of the macular fibres. He considers it probable that the hemorrhages arise by the giving way of the alcoholically diseased vessel walls under increased intravascular tension, caused by pressure of the inflamed nerve fibres.

The infrequency of this disease in early life has often been noted. Finlay, like other writers, finds it most common between forty and fifty years; but sometimes it occurs early. C. E. Shaw² reports a case occurring in a lad, aged fifteen years, who had been excessive in cigarette smoking.

J. H. Fisher³ calls attention to the observations of Langley on the influence of nicotine upon ganglionic activity. He thinks that this influence may account for the central scotoma if we suppose that from the macula the transmission of impulses is through ganglion cells, while from the periphery of the retina there is more direct transmission to the brain centres.

J. H. Parsons⁴ thinks that there is no ground for the supposition that impulses transmitted from the region of the macula travel through fewer ganglion cells than those transmitted from the periphery of the retina. He would account for the central scotoma in a general way by the extreme differentiation of the nerve elements concerned, and very probably by the greater vulnerability of this part of the eye, on account of a relatively poorer blood-supply to the retina in the region of the macula.

These writers agree in regarding the essential lesion as located in the retina. This harmonizes with the observations of Nuel that it is the nerve fibres, and not the interstitial tissues, that are first affected in the lesions produced by *felix mas*.

Birch-Hirschfeld⁵ has extended his researches regarding the origin of toxic amblyopias to the effects produced by nicotine. He finds that the view of a primary interstitial inflammation of the optic nerve receives

¹ *Annals of Ophthalmology*, July, 1901.

² *Ophthalmic Review*, May, 1901.

³ *Ibid.*, June, 1901.

⁴ *Ibid.*, July, 1901.

⁵ *Graefe's Archiv f. Ophthalmologie*, Band liii., Heft 1.

no support from experimental studies ; while many facts directly oppose it and indicate that the primary lesion is one of the nervous apparatus of the optic nerve and retina. His results also indicate that the ganglion cells of the retina are affected before or at least at the same time as the nerve fibres.

The whole weight of recent evidence is clearly in favor of the view that it is the nerve tissues—especially the neurons of the retina and their axons extending in the optic nerve—that are primarily involved in this group of diseases. The intimate relation of these nerve elements to the tissues that support them and supply them with nutriment must not be overlooked. As inflammation of the cornea is attended with hyperæmia in the zone surrounding it, so inflammatory disease of the nerve elements may be necessarily attended with more obvious changes in other elements of the optic nerve or retina.

Blindness from Beta-naphthol. J. Van der Hoeve¹ reports a case of cataract occurring in a man, aged forty years, without discoverable cause other than the use of a 3 per cent. salve of beta-naphthol for eczema of the face and neck. He also made careful tests of acuteness of vision and observations of the ocular fundus in three other cases under vigorous treatment with this drug. In one the vision became impaired, and the retina showed a slight clouding, but no alteration of the lens was apparent. In the second case there was the same clouding of the retina, and in the lens a spicule of opacity in the posterior cortex. In the third case there was noticed the same clouding of the retina. In each of these cases yellowish-white points in the retina were observed.

The conclusions reached were that disease of the lens, and even more frequently of the retina, might be caused by the medicinal use of this drug.

CATARACT PRODUCED BY NAPHTHALIN is reported by A. Lezenius.² The patient was a healthy man, aged thirty-six years, who took for enteritis 5 grammes of naphthalin with castor oil in emulsion in the course of thirteen hours. His sight remained good, and he went to bed and had a quiet night. The next morning he awakened with severe pain in the bladder, and found he was blind. When he applied at the St. Petersburg Eye Clinic his visual fields were markedly contracted, vision was reduced to counting fingers at 1.5 metres, and both lenses were clouded with masses of small gray points, the anterior surface appearing, when magnified, as though spattered with white fluid from a brush. Through the clouded lens the retina appeared hazy and the temporal portion of the optic nerve pale.

¹ Graefe's Archiv f. Ophthalmologie, Band liii., Heft 1.

² Klinische Monatsblätter f. Augenheilkunde, February, 1902.

Carbon Oxide Amblyopia. Schwabe¹ reports the case of a man overcome by gas in a sugar factory. He suffered from multiple neuritis, most severely involving the sciatic and optic nerves. In addition to the optic neuritis there was some loss of power of accommodation.

THE VISUAL CENTRES AND TRACTS.

Congenital Word Blindness. A group of cases extremely interesting from the point of view of the educator as well as from that of the ophthalmic surgeon, is reported by E. Nettleship.² He has recognized the condition in question for several years as a congenital want of power to acquire knowledge of printed signs; but acknowledges his indebtedness to J. Hinshelwood for a more accurate conception of its nature. Hinshelwood³ reported two cases and found two others in the previous literature.

The nature of the defect is indicated by the mother's account of one of Nettleship's cases—a boy, aged eleven years, with good vision: "He receives information with ease if conveyed orally. Reading is extremely difficult to him, yet he can pronounce words spelt out to him, and can spell fairly well words that are spoken to him. Immense pains have been taken in trying to teach him to read. He is very anxious to read, and will sometimes cry because he cannot see the words. He is a quiet, intelligent boy, fond of carpentering and planning, and he plays a good game of draughts."

Hinshelwood's cases were in bright, intelligent boys, not behind others of their age except that they could not learn to read. One of them could recognize by sight only a few letters of the alphabet, and, though less defective, was not perfect at reading numerals; but he recognized faces and pictures well, could repeat the alphabet and count up to one hundred quickly and correctly, could spell words given orally, and knew his reading-book by heart, although he could not read a word of it.

Another case with vision 6/5, who had special educational advantages, was able to read very slowly by taking pains; but if he read quickly he put the syllables of long words in the wrong order. He was unable to take in the name of the street painted at the corner. He remembered words by sound, but could not reproduce them by spelling. His other faculties were good. He had consulted many ophthalmologists, and one seemed to have recognized the character of his defect.

¹ Münchener med. Wochenschrift, September 24, 1901.

² Ophthalmic Review, March, 1901.

³ Lancet, May 26, 1900.

Nettleship points out that of the nine cases thus far recorded eight have occurred in boys, but that the number is still too small to permit any valuable deduction as to the relative liability of the sexes. One of Nettleship's patients, after "an enormous amount of patience and perseverance," learned to read easily, and is now a lawyer. With the others special effort to cultivate the deficient faculty left it still very imperfectly developed. Where development is possible Nettleship states that the old plan, by which the chief part of every child's early education consisted in teaching him his letters, would give the word-blind child a better chance of improvement than do some of the modern methods. On the other hand, if the defect cannot be remedied the earlier it is recognized the better for the child and his teachers. Its early recognition would be best secured by the same plan of early teaching the alphabet. In severe cases, where reasonable efforts to develop the memory for printed letters failed to bring any marked improvement, education upon other lines should be resorted to. Hinshelwood points out, although attention has not been especially drawn to the subject, that defects of this kind are not necessarily of rare occurrence; indeed, the lower degrees of deficiency may be common.

Since reading Nettleship's paper I have encountered a comparatively slight but very distinct deficiency of this kind. The patient, a bright girl, fond of study and of sewing, with perfect vision, is very backward with reading, and has marked difficulty in recognizing individual letters or in calling them by name, sometimes tracing the shape of the letter out with her hand before she can recall it. The above, with two cases since reported by Hinshelwood,¹ make 12 cases, 9 in boys and 3 in girls.

Hemianopia and the Chiasm. A case of impairment of the visual fields, variable and irregular in outline, but amounting to complete temporal hemianopia for colors, with weakening of the right internal rectus, is reported by Seggel.² The left optic disk was also rather pale. Under treatment with potassium iodide vision greatly improved, and the fields became normal except a slight limitation of the fields for form at the temporal margin. Seggel concludes that in this case the lesion was inflammatory, exerting pressure on the lower portion of the chiasm, and more severe on the left side. He accepts the common view of partial decussation at the chiasm.

I have discussed this matter before.³ It is interesting, however, to observe that Ramon Cajal⁴ also accepts the correctness of this view,

¹ *Ophthalmic Review*, April, 1902.

² *Archives of Ophthalmology*, January, 1901.

³ *PROGRESSIVE MEDICINE*, June, 1899.

⁴ *La Clinique Ophtalmologique*, July 25, 1901.

and reasons from it regarding relations between sight and the other senses and the analogies with the conditions found in the lower animals.

Warrington and Dutton,¹ reporting the microscopical study of the chiasm in tracts removed three months after the enucleation of an eye, supply the positive evidence of incomplete decussation. The degeneration was greater in the tract of the opposite side, but was unmistakable in the tract of the same side. A case of double temporal hemianopia is reported by A. H. Thompson.² It occurred suddenly after violent retching, and was probably due to hemorrhage pressing upon the chiasm. Slight neuritis was discoverable with the ophthalmoscope, and both pupils showed the hemianopic reaction to light. In this case the hemianopia was quite distinct, no other limitation of the fields being mentioned. But it must happen in the majority of cases of lesion to the chiasm that the involvement of the adjoining portions of the tracts or optic nerves will cause irregularities of one or both fields and tend to obscure the diagnosis.

DISEASES OF THE LENS.

Cases of cataract due to beta-naphthol and naphthalin have been mentioned under the head of Toxic Amblyopias.

Cataract Extraction. While there is little wholly new regarding this subject, few points can be considered as entirely settled. From the selection of cases for operation to the after-treatment, all is under discussion. For several years there has been a disposition to operate upon cataracts as soon as the loss of vision rendered the patient comparatively helpless, without waiting for so-called maturity. In no instance have I found any writer inclined to alter his practice in the opposite direction. As W. S. Dennet³ states it, "any uncomplicated senile cataract may be operated on at any time," and "the aggregate good vision of a lifetime is probably greater for each separate eye when the operations are done early rather than late."

Regarding the method of operation, simple extraction has come to be the operation of choice. Thus in the New York Eye and Ear Infirmary the reports for the year show 124 simple extractions and only 55 with or after iridectomy. J. Lewtas⁴ in 147 cases of extraction preferred iridectomy in but 33. As Dennett puts it, "simple extraction is the safest, the easiest, the handsomest, and the best operation that can be

¹ *Ophthalmic Review*, May, 1901.

² *Transactions of the Ophthalmological Society of the United Kingdom*, May 2, 1901.

³ *New York Eye and Ear Infirmary Reports*, 1901.

⁴ *Indian Medical Gazette*, July, 1901.

done," but its most enthusiastic supporters have not claimed that it was applicable to all cases of cataract.

From time to time extraction of the lens in the capsule has been suggested and practised; but afterward it has been largely discarded by its proposers, as Roosa discarded it a few years since. H. Smith¹ reports the largest series of cases operated on in this way—some three thousand cases, with good results in 96 per cent. and failures in but little over 1 per cent. In many of these cases, however, the capsule did not come away with the lens, but was extracted afterward. Smith's report covers two years' experience in India, from which part of the globe the most extensive statistics of this operation now come. It is probable that they represent a class of cases in which overripe cataract figures largely, and overripe cataract is particularly well suited to the operation of extraction in the capsule. In America, where the tendency is to save patients from prolonged blindness by early operation, it is not likely that this procedure will become general.

A similar divergence of opinion is shown as to the placing of the corneal incision. T. H. Pope,² from an experience of 5000 operations, also in India, is led to prefer an incision giving a conjunctival flap upward. The advantages he urges are early closure of the wound, prolapse of the iris seldom occurs, and the lens cortex is more easily removed. Lewtas has abandoned the conjunctival flap because of the slight hemorrhage it causes and a feeling of discomfort beneath the lid which he ascribes to it. Dennett also chooses an incision quite within the clear cornea. My preference was formerly for such an incision, but it has the disadvantage that if made a little too far within the cornea it will increase the resulting astigmatism. I think, too, that delay in the closure of the wound is more likely to occur when the incision is wholly in the clear cornea. The feeling of discomfort above referred to I have not connected with the conjunctival flap. It is probably due to bulging of the scar a few days after closure of the incision, and is not noticeably worse when the incision is placed in the corneal margin than when it is located entirely within the clear cornea.

Concerning the form of the knife, Dennett points out the advantages of the narrow Graefe knife; but probably a broader knife, which may be sold under the same name, but which is still materially different, is to be preferred.

E. Hocquard³ has studied with the microscope the corneal wound made after cataract extraction in the eyes of eight patients subsequently dying of intercurrent disease. He points out that a corneal wound

¹ Indian Medical Gazette, July, 1901.

² Centralblatt f. praktische Augenheilkunde, September, 1901.

³ Annales d'Oculistique, November, 1901.

which may appear to be in the limbus is in reality wholly in the clear cornea, touching the junction of the sclera only at the surface.

With the narrow knife the incision is rarely made in any one plane; a sawing movement back and forth results in quite an irregular division of the tissues. In an eye enucleated three days after operation the sclero-conjunctival flap was completely and solidly united, but the portion of the incision in the clear cornea was not yet at all firmly closed by exudate. The practical points thus brought out are of considerable importance. The knife which finishes or almost finishes its incision with the one forward thrust will generally leave a smoother corneal wound, and the wound which passes beneath the conjunctival flap will be far more quickly closed to infection and secure against protrusion of the iris than the wound placed wholly in the clear cornea.

In the matter of delayed healing after cataract extraction the most extreme case has been reported by Guibert.¹ In this case the anterior chamber did not re-form for three months, in spite of the measures that have been recommended for such cases—hot compresses and atropine, iodoform ointment, and eserine. The vision secured in this eye was only 1/50.

DEATH FOLLOWING CATARACT EXTRACTION. F. Fergus² reports a case in which the bacteriological examination of the conjunctival contents showed no pyogenic organisms. The eye seemed in good condition, although there was nasal disease present; but the day after operation pus was found escaping from the nostril. The condition of the eye continued satisfactory until the fifth day, when a severe rigor occurred. The following night the conjunctiva became swollen, and there was pain in the head. The eye, however, did not become infected, the wound having closed early, but the patient died on the fourteenth day from septicæmia due to the nasal disease.

Three other cases of death following cataract extraction are brought together by A. Trousseau,³ the patients prior to operation having been in comparatively good health. One death was from pulmonary congestion, another from double pneumonia, and the third from uræmia. He also reports a case in which fatal cerebral hemorrhage followed the announcement to the patient that she had cataract and should be operated upon, which announcement seemed to greatly disturb her. It is not mentioned that for any of the operations a general anæsthetic was required, but the patients were from seventy-six to eighty-nine years of age.

The avoidance of infection of the wound from septic conditions of the conjunctiva is usually sought by very careful selection of cases and

¹ La Clinique Ophthalmologique, August 25, 1901.

² Ophthalmic Review, September, 1901.

³ Annales d'Oculistique, March, 1901.

preliminary treatment of eyes that show any suspicious discharge ; but even a good deal of watchfulness may not guard with certainty against such an accident.

Fergus also reports two cases of very serious lacrymal and nasal disease in which, after the cure of these complicating conditions, cataract extraction was followed by normal healing. Fergus always has a bacteriological examination of the conjunctiva made prior to operating for cataract, and he believes that the cavities of the nose should always be thoroughly examined. While no germicide can render an operation antiseptic, previous treatment can secure aseptic conditions.

Removal of the lacrymal sac for dacrocystitis preparatory to extraction of cataract is reported by E. Rollet.¹ The extraction was done successfully twelve days after removal of the sac, the healing being by that time complete.

With regard to the use of antiseptic solutions as a routine preparation for normal cataract extraction, most surgeons are agreed that they should be abandoned ; that normal salt solution, boric-acid solution, or distilled water are equally efficient and less objectionable. H. Herbert,² however, still prefers a 1 : 3000 solution of corrosive sublimate, using such a solution freely. In one series of 497 cataract operations he had no case of grave infection. In another series, in which the solution was used less freely, he had three primary infections ; and in a third series, in which a weaker solution was employed, panophthalmitis occurred three times, and in seven cases there was iritis. My own practice is for the purpose of cleansing the eye to use a 1 : 1000 solution of tricresol. It is much less irritant than the sublimate solutions, scarcely more so than boric-acid or salt solutions, and yet it seems to be an efficient antiseptic, doing all in that direction that can be done for the eye.

AFTER-TREATMENT. The after-treatment of cataract extraction is still discussed with reference especially to the necessity for bandages or fixed dressings. C. Frohlich³ has collected 680 extractions done by nine operators, including fifty of his own, treated by various modifications of the open method, with eight infections. Most of the modifications of the open method include the covering of the eye with some sort of mask. This protects from contact and sometimes from light, but leaves the movements of the lids free to aid in disposing of the discharges. It is safe to conclude that the risks of the operation are not seriously increased by the open method ; but, on the other hand, it is doubtful if the comfort secured for the patient is greater by this plan than

¹ La Clinique Ophthalmologique, July 25, 1901.

Indian Medical Gazette, July, 1901.

³ Klinische Monatsblätter f. Augenheilkunde, April, 1901.

under some light dressing which makes no pressure upon the wounded eye.

AFTER-CATARACT. The varieties and treatment of this condition were the subjects for discussion at the last meeting of the British Medical Association. F. R. Cross,¹ in opening this discussion, stated that the leaving of considerable lenticular substance is not, as a rule, followed by thick after-cataract, but that the dense, tough membranes follow inflammation. Before proceeding to operate for secondary cataract one should know the history of the healing after the primary operation, and should bring the patient into good general condition; and the eye should be quiet, especially if the primary operation has been followed by serious inflammation.

He prefers to operate with a "Bowman needle," modified so that it has a long cutting edge that can be used as a knife. When difficulty is encountered a second needle must be introduced from the opposite side, taking care to pass it through the same opening in the capsule, and the double-needle operation employed. It is useless to attempt to tear a thick, movable membrane with a needle; still one, having introduced the needle, should endeavor to ascertain the attachments of the membrane in order to choose the safest and most effective method of dealing with it later. Where the capsule is firmly fixed Cross thinks there can be no doubt of the great value of the operation with scissors, although this requires a free opening of the cornea and permits the escape of the aqueous. Extraction of the capsule with forceps he regards as the last resort, yet sometimes necessary.

In some cases he has seen an opaque form of vitreous degeneration result from simple needling. A line of infiltration extends back into the vitreous not unlike a line of bacterial growth in a culture. It does not, however, lead to pus formation, and, while the sight is much impaired by it, no general degeneration of the eye takes place.

In continuing this discussion² Darier and Marshall agreed that unnecessary damage was done by going deeply into the vitreous. T. Thompson thought that the risk was not materially increased by puncture of the vitreous, and preferred to operate with a ground-down Graefe knife. A. H. Thompson alluded to the significance of the points of entering the needle. He introduced it through the conjunctival margin. This plan I have followed for many years, and regard it as extremely important in preventing infection.

The same subject was discussed by the Société d'Ophthalmologie de Paris.³ Valude thought that the choice of operation lay between

¹ Ophthalmic Review, October, 1901.

² British Medical Journal, November 2, 1901.

³ Recueil d'Ophthalmologie, August, 1901.

laceration with needles, division with a forceps-scissors, and extraction. The latter is applicable to but few cases, and the first is the operation of preference where it could be made effective. He ascribed the bad results following such operations to traction on the ciliary processes. The risk of such operations is a matter of the widest difference of opinion, and it seems impossible to judge as to the important factors of that risk until these operations are reported with more exactness of detail than has heretofore been customary.

THE VITREOUS HUMOR.

Hemorrhage into the Vitreous. According to the sources of the bleeding, N. C. Ridley¹ holds that the anatomy and pathology of these cases differ. When the blood comes from the retina the hyaloid is generally detached, the blood lying between the retina and the vitreous, unless the latter is disorganized, in which case the blood penetrates it. When the blood comes from the ciliary vessels, on account of the firmer attachments of the hyaloid in this region, it breaks through that membrane and penetrates directly into the vitreous.

Etiologically, Ridley classifies these hemorrhages as: (1) Traumatic; (2) due to general diseases, as anæmia, renal diseases, or vascular degenerations; (3) occurring in high myopia; (4) occurring with glaucoma. The treatment is much the same for all—rest, dark glasses, avoidance of exertion, sometimes keeping the patient in bed for a few weeks, and iodide of potassium internally. Except in glaucomatous cases a weak atropine solution may be used. The prognosis is extremely uncertain, yet more favorable than in other forms of intraocular hemorrhage.

Ridley reports 6 cases in patients of sixteen to sixty-four years of age, but none of them is an example of the recurring hemorrhages in young men that I have before referred to.² Fehr³ reports 8 cases of such recurring hemorrhages in young persons, fifteen to twenty-five years of age, but 2 of his patients were young women. In all of these cases more or less extended inflammatory alterations could be demonstrated ophthalmoscopically or microscopically in the eye-ground. These alterations in the choroid or retina he regards as co-ordinate with vascular disease which caused the hemorrhages.

In a series of 8 cases reported from Giessen by F. Bening⁴ 7 were apparently connected with chorio-retinitis. One of these cases was under observation for numerous recurrences over a period of ten years.

¹ Ophthalmic Review, August, 1901.

² PROGRESSIVE MEDICINE, June, 1900.

³ Centralblatt f. praktische Augenheilkunde, February, 1901.

⁴ Inaugural Thesis, 1901.

Vascular Growths in the Vitreous. These are usually seen to follow hemorrhages, but in a few cases the hemorrhage is not observed. A case of this latter kind is reported by W. B. Marple,¹ with a careful anatomical study of the eyeball, which was enucleated because the character of the growth could not be certainly recognized as benign. Marple has also collected 14 cases previously reported, and finds that in all of them retinitis with or without retinal extravasations was present, and the changes incident to this condition must be regarded as the direct local causative process. It is truly a retinitis proliferans.

A case of similar character occurring after typhoid fever is reported by L. D. Brose.² The ocular symptoms commenced with sudden loss of sight from hemorrhage into the vitreous in the sixth week of the fever. The subsequent growths in the vitreous prevented restoration of anything like good vision. Both eyes were similarly affected.

Vitreous Opacities. Opacities in the vitreous are sometimes ascribed to menstrual disorders, but the connection is not always so probable as in a case reported by R. Bylsma.³ The patient, aged sixteen years, was chlorotic, and had not menstruated for three months. The retina and choroid appeared normal, except slightly anæmic. Under tonics, exercise, stimulating hip-baths, and diaphoretics rapid absorption of the opacities occurred; but at the fourth and fifth months menstruation did not appear, and the opacities showed temporary increase. Later, when menstruation appeared, they rapidly cleared up.

DISORDERS OF THE INTRA-OCULAR TENSION.

Glaucoma. JAVAL'S CASE. The literature of the last year relating to glaucoma would fill a volume larger than this. The most striking contribution to it is the history by E. Javal of his own case. This eminent French ophthalmologist, blind in both eyes after more than a dozen operations and the use of myotics, with an energy, exactness and a persistence described in no previously reported case, has made one of his most important contributions to ophthalmology in these auto-observations on glaucoma.⁴

The first symptoms appeared in the right eye in 1881. In 1885 the first operation was done on that eye—an upward anterior sclerotomy. Subsequently a downward sclerotomy, then an upward iridectomy, and afterward a posterior sclerotomy were done on this eye, and it was

¹ Transactions of the American Ophthalmological Society, 1901.

² New York Medical Journal, February 15, 1902.

³ Annals of Ophthalmology, January, 1902.

⁴ Annales d'Oculistique, September, 1901.

enucleated in 1900. The left eye showed the first symptoms in 1885. In spite of myotics and the most careful regimen its usefulness had become greatly impaired, when in 1900 it was subjected to upward iridectomy. Subsequently it underwent scleral punctures, a ciliary operation, and an anterior sclerotomy, and at last the superior ganglion of the cervical sympathetic was excised. There remained, June, 1901, bare perception of light for an instant when the eye is suddenly exposed to it.

Javal's case illustrates nearly all the important features of glaucoma discussed in the year's literature. In presenting it he says: "In the present state of our knowledge operative intervention was justified in both of my eyes. In both the result was unfortunate. Possibly in the details which follow may be found circumstances which should have justified earlier intervention or avoidance of it." Javal's account of his case was elicited by a discussion upon glaucoma in which L. de Wecker had alluded to his unfortunate confrère.

OPERATIONS FOR GLAUCOMA. De Wecker¹ argued for the curability of simple glaucoma by iridectomy, or sclerotomy, or a combination of both. The non-irritant, chronic forms he would still class as glaucoma, because of the transformation from the simple to the inflammatory type, because one eye may show inflammatory and the other simple glaucoma, or because in one family several members may show inflammatory glaucoma and the others simple. De Wecker has collected the experiences of many of his colleagues, and confining the term to cases which show evidences of increased tension, most of them advocate early operative interference, although the group of surgeons that he characterizes as "abstentionists" includes some very careful observers.

O. S. Bull² defines the class of cases of simple chronic glaucoma in which operations are not advisable as including those advanced cases that show great contraction of the visual field, impairment of vision, increased tension, and deep cupping of the disk. Cases in which contraction of the field has approached close to the fixation point also belong in this class.

Javal³ suggests that in his own case it might have been better to have done a lateral iridectomy rather than to have operated upward or downward, and he points out that Graefe's early cases were all operated on from the nasal side of the cornea.

H. Dor,⁴ from 247 iridectomies, obtained improvement of vision in 76 per cent., and arrested progress in 18 per cent. He did not resort to this operation for cases of absolute glaucoma. Of sympathectomy, de Wecker

¹ *Revue Générale d'Ophthalmologie*, July, 1901.

² *Medical News*, January 18, 1902.

³ *Annales d'Oculistique*, June, 1901.

⁴ *Ibid.*

concludes that it should not be substituted for operations on the eye in simple glaucoma, but should be reserved for those exceptional cases which are called malignant. Its action cannot be counted upon as certain or durable, and failure of sympathectomy seems to render more perilous subsequent operations on the eye, transforming a simple glaucoma into one of the acute or inflammatory type. With regard to this last point, I think there is much reason for doubt. The cases in which such a transformation has followed sympathectomy are very few, and, as de Wecker himself points out, it frequently occurs where no operation of the kind has been practised.

PROGNOSIS WITH IRIDECTOMY. O. Haab¹ reports an experience with 570 glaucoma operations, 279 iridectomies, and 291 sclerotomies. He likes sclerotomy, but concludes that iridectomy is and remains the principal operation for most cases of glaucoma. His experience gives the following proportions of good results: Acute glaucoma, 77 per cent.; simple glaucoma, 71 per cent.; chronic inflammatory glaucoma, 47 per cent.; and hemorrhagic glaucoma, 40 per cent. He also reports 40 per cent. of good results from treatment with myotics.

In his presidential address D. Little² gives his experience in the treatment of glaucoma, which he summarizes thus: "Looking back over the whole of my experience, my confidence in iridectomy is increased rather than diminished, and I would give to that operation the widest field in the treatment of chronic glaucoma." He has been able to trace 37 cases for periods varying from seven to thirteen years after operation: 10 had become blind—1 from atrophy of the globe, another from recurrence of glaucoma, and the remaining 8 from atrophy of the optic nerve, although the tension had remained normal. In 4 other cases vision had considerably deteriorated from atrophy of the nerve. In 23 cases the tension remained normal and vision substantially the same. In a few it was a little worse, in others it was better than at the time of the operation; but on the whole their condition and outlook were satisfactory. F. Mendel³ reports upon 234 cases treated in Hirschberg's clinic in seven years. Iridectomy effected relative or complete cure in 82 per cent. of acute and 77 per cent. of chronic inflammatory glaucomas.

W. Wagner⁴ reports 4 cases of iridectomy for simple glaucoma in which the disease remained completely arrested at the end of periods ranging from eleven to seventeen years; and these cases were not of the class deemed most favorable, for vision had been greatly impaired,

¹ *Das Glaucom und seine Behandlung*, Zurich, 1902.

² *Ophthalmic Review*, December, 1901.

³ *Berliner klinische Wochenschrift*, February 3, 1902.

⁴ *Klinische Monatsblätter f. Augenheilkunde*, August, 1901.

and the visual fields contracted before iridectomy was done. The only possibility of doubt regarding the value of iridectomy in these cases will arise from uncertainty as to how long simple glaucoma may remain stationary without treatment. I have seen very little advance in the process in a period of ten years in one case, but such instances must be quite exceptional.

SYMPATHECTOMY. A careful review of the literature regarding extirpation of the superior cervical ganglion of the sympathetic for glaucoma has been made by Ziehe and Axenfeld.¹ Their conclusions are based upon 74 cases. Only 1 operation resulted in death, showing that it is not attended with any great danger. They do not think it proved that the operation is detrimental. (See above.) On the other hand, it is demonstrated that a certain number of glaucomatous eyes can be improved for many months, and in some cases the process seems to have been checked. They would not advise the operation prior to iridectomy, and think that even in simple glaucoma it should not supplant iridectomy. It is not applicable to absolute glaucoma unless the blindness is recent. Pain with complete blindness will only be certainly relieved by enucleation. Sympathectomy should often be followed by the use of myotics. Whether it can prevent glaucoma has not been determined.

C. Abadie,² who has welcomed the operation on theoretical grounds, regards sympathectomy as the particular operation for chronic simple glaucoma; and he thinks it is to be resorted to after iridectomy for acute glaucoma, if the ocular operation is not sufficient, and especially if the pupil remains dilated.

Cases not included in the review of Ziehe and Axenfeld are reported by J. Mullen,³ with temporary improvement which was not lasting, and by D. H. Coover,⁴ with a similar result. Two cases reported by H. W. Dold⁵ showed a similar temporary improvement. L. Dor⁶ tried iridectomy upon the right eye, and removal of the sympathetic on the left side, for bilateral glaucoma. The improvement on the left side was more marked, but the case was reported within a few weeks after the operations. In a case reported by H. J. Williams⁷ the condition four months after operation was one of normal tension and widened field of vision, with no improvement of visual acuteness. A similar result is reported by W. Altland⁸ seven months after the operation, the patient's other eye having been lost by simple glaucoma.

¹ Sympathicus Resektion beim Glaukom., Halle, 1901.

² La Clinique Ophtalmologique, February 25, 1901.

³ American Medicine, June 22, 1901.

⁴ Philadelphia Medical Journal, March 16, 1901.

⁵ Lancet, March 23, 1901.

⁶ Revue Générale d'Ophtalmologie, July, 1901.

⁷ Medical News, April 6, 1901.

⁸ Klinische Monatsblätter f. Augenheilkunde, February, 1902.

The most important single case of sympathectomy for glaucoma in the literature of the past year is one reported by M. Black.¹ Cases previously reported have almost without exception been cases that would not be considered favorable for iridectomy, and in which myotics have failed to arrest the course of the disease. If a new operation could have saved them, or a considerable proportion of them, its superiority would have been at once demonstrated; but failure to help such cases would not prove that a new procedure was without value.

Black's case, on the other hand, had been affected less than three months, and, although vision was reduced to counting fingers at one foot, during the exacerbation in which the patient was first seen it was restored to normal by the use of eserine. Although the case seemed in every way a favorable one for iridectomy, it was treated by removal of the superior and middle sympathetic ganglia of the affected side—the left.

At the time of the operation, the patient having been some days without eserine, vision was reduced to counting fingers at twelve feet. The tension was +2, the pupil dilated, and the cornea steamy. Six hours after the operation the pupil was reduced to $1\frac{1}{2}$ mm. in diameter, vision had improved, and the tension was normal. On the fourth day full vision had been recovered, and this was maintained, with no return of any symptom of glaucoma nine months after the operation. This case I saw with Dr. Black, and considered it in every way a case for iridectomy; but no iridectomy could have given a better result than has to this time been secured by sympathectomy. A single case proves very little; yet this was such a typical case of subacute glaucoma, so certain without efficient treatment to grow worse, that it is impossible to escape the conclusion that the operation exerted a powerful beneficial influence. The pupil continues smaller than the pupil of the sound eye, and there is a slight ptosis, but otherwise the eye appears to be normal.

TREATMENT OF THE SECOND EYE. This subject of great practical importance has been discussed by de Schweinitz and others.² Glaucoma is generally bilateral. Often one eye has been rendered practically useless before the patient submits to radical treatment. Even when that is not the case the time comes when the second eye is threatened, as it was with Javal. Mischance in connection with an operation might precipitate the dreaded blindness, but all our experience goes to show that operations for glaucoma are most efficient when done early. In view of the gravity of the issues involved, this is a question about which definite rules for our guidance are greatly to be desired.

¹ *Ophthalmic Record*, October, 1901.

² *Transactions of the American Ophthalmological Society*, 1901.

de Schweinitz's recommendations are : In acute glaucoma, and also in chronic congestive glaucoma, if the history of the case or the examination of the apparently unaffected eye indicates that it is likely to suffer like its fellow, it should be operated on as soon as the anterior chamber is restored in the other eye. If the patient will pass out of reach of expert assistance it might be justifiable to suggest a "preventive iridectomy," even in the absence of any symptoms. In simple glaucoma if even temporary increased tension can be demonstrated, or if careful perimetric examination reveals impairment of the visual field, operation should not be postponed.

In the discussion elicited by de Schweinitz's paper his recommendations were fully indorsed by C. S. Bull, S. D. Risley, and E. Gruening, and also, except in regard to simple glaucoma, by the following : S. Theobald, C. J. Kipp, P. A. Callan, T. R. Pooley, M. Standish, and C. H. Williams. My belief is that de Schweinitz's recommendations are wise, except that in simple glaucoma I do not feel sure enough of the ground to proceed without a careful explanation to the patient or his representative of the risks to be encountered on either side.

RELIEF OF PAIN BY DIONIN. A drug that can be relied on to mitigate the pain of glaucoma will be welcomed by ophthalmologists, even though its use may be attended with the risk of inducing the patient to delay his consent to an operation which his best interests imperatively demand. Dionin is not yet proven to be such a drug, the cases in which it has been tried are too few to establish anything ; still the reports regarding it are so favorable that it may well be given a careful trial in any case in which the pain of glaucoma cannot for the time be relieved by established curative measures.

A. Darier¹ reports a case of acute glaucoma with very high tension in which under repeated instillations of a 5 per cent. solution of dionin, in spite of the chemosis and swelling of the lids which these caused, the patient was relieved in about an hour, his tension was somewhat reduced, the cornea became clearer, and vision improved. The continued use of a 1 per cent. solution of dionin with $\frac{1}{2}$ per cent. of pilocarpine in distilled water, with massage of the eye, cut short the attack, and the patient continued well five weeks later.

The complete relief of pain in three cases is reported by Simi.² One was a case of hemorrhagic glaucoma, treated first by three applications of the powder and then by instillations of a 6 per cent. solution three times a day. The second was a hemorrhagic glaucoma of eighteen months' duration, with exacerbations, which were relieved by a single application. The third case was an attack of acute glaucoma. Simi

¹ La Clinique Ophtalmologique, April 25, 1901.

² Bollettino d'Oculistica, 1901.

believes that dionin not only acts as an analgesic, but that it also reduces tension.

In a case of glaucoma succeeding albuminuric retinitis A. Terson¹ was able to give complete relief by instillations of a 2.5 per cent. solution. Myotics had given but little relief, and the eye was without light perception, of stony hardness, and extremely painful; but under dionin it became free from pain and irritation, although it remained quite hard. A solution of double the above strength was no more efficient as an analgesic, and caused a severe chemosis.

It is pointed out by Darier² that dionin, although a powerful and lasting analgesic, is a very feeble anæsthetic; and the discomfort and swelling it produces render it quite inferior to cocaine and holocaine for the production of local anæsthesia, even if it were equally efficient.

PATHOGENY OF GLAUCOMA. That there are important factors in the causation of glaucoma, a knowledge of which seems almost within our reach, but which still elude us, is the feeling of most careful students of the subject. An effort to extend our knowledge in certain directions has been made by Uribe-Troncoso.³ His work deals chiefly with the alterations of the intra-ocular fluids, especially the aqueous humor, one of the least known probable factors in the production of increased intra-ocular tension. He reports nineteen analyses of the humors obtained from glaucomatous eyes, and comparative studies of the humors from normal eyes, and of the primary supply, with that which replaces it after the former has been drawn off. Such studies, he holds, give valuable indications regarding the nutrition of each eye.

In general, the density of the aqueous was found to be greater in glaucomatous eyes, and much higher in the primitive aqueous than in that which replaced it. In the glaucomatous eyes both the mineral and the organic constituents were increased in proportion to the water. The presence of albumin in the aqueous he believes is the initial phenomenon in the succession of symptoms which characterize glaucoma. The normal vessels of the ciliary body and iris retain the albumin, but when they are altered they permit it to mix with the aqueous. Experimenting on the eyes of rabbits, he found that injecting an albuminous fluid into the anterior chamber caused both the increased tension and the reactional phenomena of glaucoma, even though the drainage channels of the anterior chamber remained free. And the increase of tension and the irritative phenomena disappeared as the albumin was eliminated.

¹ *La Clinique Ophtalmologique*, July 25, 1901.

² *Ibid.*, January 10, 1902.

³ *Annales d'Oculistique*, December, 1901.

THE LACRYMAL GLAND.

Dacryo-adenitis. Inflammation of the lacrymal gland, with the formation of a periglandular abscess, is reported by A. Maklakow.¹ The patient, a woman, aged thirty-nine years, had a tumor the size of a large walnut, which, without apparent cause, had developed in the course of three weeks in the outer part of the upper lid. The swelling presented the usual signs of abscess, which on being opened was found to involve the region of the gland. In three weeks there remained but a little swelling and redness. In the literature of the subject Maklakow finds among fifty-eight cases of dacryo-adenitis but seven in which there was abscess. He thinks this was a case of chronic inflammation of the gland, with periglandular abscess. There is a possibility that this lesion was preceded by a light attack of la grippe.

In the above case the eye was displaced downward by the tumor, and when a probe was passed into the abscess cavity it was readily carried to the periosteum at the upper outer margin of the orbit. We must conclude that the main lacrymal gland was involved. It is probably much more common for the lower anterior part of the gland—the so-called palpebral portion, the congregate glands, the glands of Rosenmüller—to be the seat of suppurative inflammation. Mackenzie pointed this out, and said that “having somewhat the appearance of a hordeolum or sty, it often passes as such.” Since his time, except for two Italian writers, it has received scarcely any notice in ophthalmic literature until this last year.

Sourdille² reports three cases, in two of which he removed diseased tissue and studied it microscopically. It is a disease of youth, and mumps and measles, he thinks, seem to prepare the gland for it, and suppuration involving the lids or conjunctiva seems to excite it. It begins with pain, redness, and swelling, and there is marked partial chemosis. The pre-auricular gland may be involved. In four to six days suppuration occurs, and the pus escapes from between the outer commissure of the lids and the globe. L. Lor³ reports five cases of this affection observed in patients of five months to seventeen years of age. In all cases it was unilateral. He could not trace it to preceding disease. But as all his cases were seen within a single year, and as others have seen cases in groups, he thinks it may be epidemic. Three bacteriological examinations of the pus revealed the presence of the yellow staphylococcus.

¹ La Clinique Ophtalmologique, October 10, 1901.

² Archives d'Ophtalmologie, August, 1900.

³ Annales d'Oculistique, October, 1901.

In the way of treatment Sourdille recommends excision of the diseased portion of the gland. But Lor thinks this a histological rather than a therapeutic treatment. He approves of the plan of Mackenzie—dependence chiefly on warm applications. Evacuation of the pus would be proper; but it is not always easy in children, and is not often necessary. Spontaneous evacuation through the ducts or through the conjunctiva usually occurs early. It is doubtful if such inflammation has any sequels, although Sourdille suggests a subsequent dacryops as a possible result of the injury to the parts.

Tuberculosis of the Lacrymal Gland. This rare condition is in some important respects very much of a mystery; and the most recent case, reported by E. Stieren,¹ does little to clear it up. In less than half of the reported cases in which the gland has been excised and examined microscopically has any specimen of the tubercle bacillus been found, although the structural peculiarities of tubercle were well-marked.

Stieren's patient was a colored girl, aged thirteen years, with cough, expectoration, loss of weight, night-sweats, and general enlargement of the lymph glands. Each upper lid covered a hard, lobulated tumor, firmly attached beneath the outer part of the upper margin of the orbit, and joined to it below an equally hard, flatter mass—the accessory gland. The conjunctiva presented the characteristic appearances of tuberculosis of that membrane. In this case the tumors were not excised, but repeated examinations of the sputum failed to reveal any tubercle bacilli. Scrapings from the conjunctiva were also examined repeatedly, with entirely negative results; and inoculations of these scrapings into the eye of the rabbit and the peritoneum of the guinea-pig also failed to demonstrate the presence of tubercle bacilli.

The patient was put upon cod-liver oil and creasote, with out-door life and appropriate diet. In four months the other glands had become of normal size and consistence, but the lacrymal glands were unchanged, and the condition of the conjunctiva, although improved, was still far from normal. The suggestion of excision of the lacrymal glands caused the patient to disappear for two months, and then she returned with both glands and conjunctiva normal. She had gained eighteen pounds in weight, was free from cough and night-sweats, and healthy in appearance.

Stieren brings together twelve previously reported cases of this condition of the gland. He concludes that tuberculosis of this gland must be hematogenous in origin, and since it may recover without, surgical intervention is only indicated after therapeutic and proper hygienic measures fail.

¹ Bulletin of the Johns Hopkins Hospital, November, 1901.

Dislocation of the Gland. A spontaneous hanging down of the lacrymal gland, so that its position can be seen through the upper lid, usually associated with marked relaxation of adjoining tissues, is not a very rare condition. A case probably of this kind was shown by Terrien¹ at the Paris Ophthalmological Society. But simple dislocation of the gland by traumatism must be very unusual. A case supposed to be of this nature is reported by W. F. Mittendorf.² A young lady fell forward, striking the upper part of the outer corner of her left eye against her brother's outstretched finger. It caused severe pain, which was relieved by ice applications; but the next day a hard, white, almond-like swelling was discovered on the upper temporal part of the eyeball. The tumor was slightly painful to touch. It could be pushed upward a little, but descended immediately when pressure was withdrawn. The upper outer part of the orbit was a little tender. At the end of three months the tumor remained unchanged and still sensitive.

Effects of Extirpation. A very annoying form of conjunctivitis, with sticky, irritating secretion and photophobia, was encountered by D. J. Blok³ after removing the lacrymal gland. It was not cured by treatment of the nose, which others have reported effective. Such a sequel must be quite exceptional.

Reflex Epiphora. This is commonly ascribed to alterations of the innervation of the lacrymal gland—a very natural inference when we remember the connection of the shedding of tears with emotion and pain, or the normal results of a strong cold wind blowing in the face, or the effects of pungent odors, or the presence of an irritant in the conjunctiva; but regarding the channels by which such impulses reach the gland there is still uncertainty. Wilbrand and Saenger,⁴ from a full consideration of the observations bearing upon the question, conclude that it is still unsolved. Many facts and observations strongly indicate that the gland is innervated through the facial nerve, but others indicate that it is innervated through the trigeminus or the sympathetic. Either there must be great variations, so that now one, now another, of these nerve trunks carries the nerve impulses, or there is a combined action between two of these nerve trunks or between all three of them.

An example of epiphora relieved by circumcision is reported by D. Roy⁵ as epiphora due to spasmodic contraction in some portion of the lacrymal passages. The probability of the diagnosis is supported by

¹ *Annales d'Oculistique*, August, 1901.

² *Transactions of the American Ophthalmological Society*, 1901.

³ *Annals of Ophthalmology*, January, 1902.

⁴ *Neurologie des Auges*, Band ii., S. 29.

⁵ *Carolina Medical Journal*, January, 1902.

citations from several European authorities. But his query addressed to prominent American ophthalmologists elicited the fact that none of these had seen any case which he ascribed to such a spasmodic constriction. Nor does Roy give any observations regarding his case that would oppose the view that the epiphora was due to increased secretion rather than to obstruction to the escape of the tears through the lacrymal passages.

A most peculiar anomaly of secretion is reported by A. Antonelli,¹ occurring in a healthy girl, aged ten years. Whenever she chewed there occurred a free secretion and overflow of tears from the right eye. This had been noticed from the time she began to eat solid food. On the other hand, when she "cried" from emotion the right eye remained dry, while the tears flowed freely from the left. Irritants applied to the mucous membrane of the nose or eyes produced the secretion of tears in both eyes.

The dependence of reflex epiphora upon eye-strain has been emphasized by various writers. F. C. Riley,² in referring to its dependence on hyperopia and presbyopia, points out that while the first treatment should be the correction of the error of refraction, there may be a complication in the way of obstruction produced by swelling of the mucous membrane within or adjoining the canaliculus. This he meets by dilating the canaliculus as often as may be necessary, beginning with the smallest probes, and using the greatest gentleness, to avoid bruising or irritating the lining of the canal or tearing it, as such accidents would be likely to cause more serious organic obstruction.

Tumors of the Lacrymal Gland. These are rare, but three cases are reported by C. Fromaget.³ The first was a sarco-myxofibroma of the palpebral portion of the gland, in a man aged twenty-four years. The tumor, which was the size of a cherry, was removed through a curved incision just below the eyebrow. This tumor had the appearance of a large chalazion, but on attempting to seize it it would slip up under the margin of the orbit. For removal it was kept down by a spatula held under the upper lid.

The second case was an epithelioma of the orbital portion of the gland, in a man aged fifty-six years. For six months there had been progressive exophthalmos, with neuralgic pain. The eye protruded 1.5 cm., could barely be covered by the lids, and the cornea was ulcerating. It was removed by dividing the external canthus, strongly everting the upper lid, and enucleating through a conjunctival incision.

¹ La Clinique Ophtalmologique, February 10, 1902.

² American Medicine, December 21, 1901.

³ La Clinique Ophtalmologique, July 25, 1901.

This was easily accomplished, the tumor being enveloped in a fibrous capsule free from adhesions.

The third case was one of hydatid cyst of the orbital portion of the gland. A woman, aged sixty-five years, had suffered seven months from troublesome diplopia, without pain or impairment of vision. For the last month there had been progressive displacement of the eyeball forward and downward, with violent pain. The upper lid was completely paralyzed and vision was abolished. The eye was immovable. The tumor was rounded, fluctuating, and free from pulsation. Removal was effected through an incision in the region of the eyebrow, where the scar was subsequently entirely concealed by the growth of hair. The cyst had a thin wall and was bilocular.

LACRYMAL PASSAGES.

Concretions in the Canaliculus. These are rare and liable to be overlooked. Two cases that had previously been some time under treatment, without having the real nature of the trouble recognized, are reported by J. Hirschberg.¹ The region of the tear sac was normal in each case, but in the course of the lower canaliculus was a rounded swelling. The lower punctum was widened, and from it a little pus could be forced out by pressure on the tumor. On opening the canaliculus a greenish or yellowish-green mass was found, the third of the size of a lentil. This was hard in one case, but crumbled readily in the other. The signs which should lead to the recognition of this condition are continuous epiphora, the reddening over the swelling, and the presence of mucopus at the inner canthus. In a few cases the concretion has been situated in the upper canaliculus, and masses of much the same character have been found in the sac.

Hirschberg had these concretions examined by Kempner, who reported them to be chiefly composed of a leptothrix, and this organism was obtained from them in pure culture. In Graefe's original descriptions of this condition the growth was described as a leptothrix, but of late years most of the cases have been described as due to streptothrix, or cladothrix, or to a form of actinomyces. Probably only careful culture experiments with the organisms found will settle the identity of the organism or organisms forming these so-called dacryoliths.

G. Mackay² reports a case in which microscopical examination showed the structure of the ray fungus.

A. Bourgeois,³ reporting two cases without any extended microscop-

¹ Centralblatt f. praktische Augenheilkunde, January, 1902.

² Ophthalmic Review, July, 1901.

³ La Clinique Ophtalmologique, May 25, 1901.

ical study, suggests that for the present the condition be called one of pseudo-actinomycosis. On clinical grounds—its benign tendency and slight disposition to cause suppuration—he cannot regard it as true actinomycosis. The importance of the lack of malignancy in this connection is also appreciated by J. Terson,¹ who reports two cases, in one of which, observed by his father, the concretion was as large as a “little walnut.” In his own case the concretion was submitted for examination to Professors Labat and Leclainche. They found the threads of a cladothrix, but not the central masses. While they regarded the organism as closely related thereto, they could not determine its identity with *actinomyces bovis*.

Terson also points out that the administration of potassium iodide has not the importance in connection with lacrymal concretions that attaches to it in connection with actinomycosis; that in the former affection the complete removal of the concretion is always indicated. The uselessness of the iodide is the more interesting because of its well-known excretion in the tears. More important evidence of the non-identity of these two conditions may be found in a careful consideration of the symptoms of actinomycosis of the conjunctiva as observed in the few reported cases.² The attempts to discover the origin of these concretions through the case-history has always been a failure. The history is negative. The symptoms begin so gradually that the patient has great difficulty in fixing the date of their onset, and occupation and surroundings throw no light on the subject.

Removal of the Lacrymal Sac. This is more frequently resorted to than formerly. From ten years' records of the clinic at Giessen H. Brandes³ collected 97 cases. O. Scheffels⁴ personal experience for the same length of time included 24 cases of extirpation and 37 cases of destruction of the sac. Mayweg⁵ in five years has done 174 extirpations and 7 obliterations of the sac. Methods of removing and destroying the sac and the indications for such procedures have been given in former years. Albrand⁶ would extend the application of such operations to those who cannot take the time needed for treatment by probing.

Scheffels prefers destruction of the sac with caustics as being the less formidable undertaking. He does the operation under local anæsthesia from 3 per cent. solution of tropæocaine injected at two points over the sac, and holocaine solution dropped in the conjunctiva.

¹ La Clinique Ophtalmologique, April 10, 1901.

² PROGRESSIVE MEDICINE, June, 1900.

³ Inaugural Thesis, 1901.

⁴ Klinische Monatsblätter f. Augenheilkunde, April, 1901.

⁵ Ibid., September and October, 1901.

⁶ Deutsche med. Wochenschrift, April 4, 1901.

Both canaliculi are slit and a free opening made at the point of their entrance into the sac. A piece of Vienna paste, the size of a hemp-seed, is thinly wrapped in cotton and, by means of scoop-forceps, is introduced to the bottom of the sac. Here it is allowed to remain two minutes, and then removed with the forceps. A similar piece of the caustic is next placed, in the same way, for two minutes in the upper end of the sac, and, if it be very large, the third bit of paste is similarly used about the middle of the sac. The eyeball is protected from the caustic by covering it with a salve, and rotating it outward. The cauterization is quickly followed by swelling of the parts, including chemosis. For excessive pain the ice compress may be used the first day, and from the second day poultices cause these symptoms to quickly disappear.

Scheffels opened a discussion on the subject before the meeting of ophthalmic surgeons in Bonn. In this discussion Pfalz¹ thought that, with rare exceptions, extirpation should have the preference over destruction of the sac, on cosmetic grounds and because of quicker healing. Thier took essentially the same view. Mayweg had started with destruction of the sac, after the method of A. Pagenstecher, with chloride of zinc paste; but he had so changed his practice as to resort to extirpation in the proportion of cases above mentioned. Stood also favored extirpation, but he did the operation in more than half his cases without general anæsthesia. At the Ophthalmic Society in Copenhagen C. F. Bentzen² reported six cases of extirpation for blenorrhœa of the sac. He regards removal as a remedy of last resort. E. Hansen agreed in this estimate, and K. Lundsgaard urged its cosmetic superiority.

RESULTS OF OPERATION. Of Scheffels' 37 cases of destruction of the sac all but 2 healed well without further interference. Of the 97 cases reported by Brandes all but 3 are said to have healed by first intention in an average period of five days; but in 1 case there occurred orbital cellulitis, retrobulbar neuritis, and partial optic atrophy. Mayweg says that of his 174 cases the results were good in all but 4; 2 of these had tuberculosis, and in 2 some mucous membrane was left behind.

Plaut and von Zelewski³ collected 40 cases from the clinic at Rostock. Of these 30 were clinically sound, and were used for a study of the germ contents of the conjunctiva after extirpation of the tear sac. They found that the epiphora had been entirely stopped in 2 cases, was very slight or insignificant in 16, was moderate in 9, and was decided or severe in 3. Of the bacteria that commonly inhabit the

¹ *Klinische Monatsblätter f. Augenheilkunde*, September and October, 1901, p. 799.

² *Ibid.*, p. 806.

³ *Ibid.*, May, 1901.

conjunctiva they found the "xerosis bacillus" in 29 of the 30 cases, staphylococcus albus in 17, staphylococcus aureus in 6, the pneumococcus in 1 case, and diplobacilli in 3 cases. These figures do not differ radically from the results of examinations of the conjunctiva of normal eyes, nor did these organisms show any increased power of infection.

OTHER METHODS OF TREATMENT. PROTARGOL SOUNDS. The use of these in the treatment of all cases of inflammation and obstruction of the lacrymal passages has been practised by Antonelli for two years, and he again urges the advantages of the method.¹ It is not a substitute for removal of the sac, but is suited to those cases that are capable of relief by milder methods. The sounds are made of gelatin containing 50 per cent. of protargol, and are 3 to 4 cm. long and the thickness of a No. 4 Bowman probe. After the passage of a No. 5 or 6 Bowman probe one of these is dipped in water an instant to soften and lubricate it, and introduced through the slit canaliculus into the sac and duct. It there dissolves slowly, the nasal mucous showing the stain of the protargol for several hours afterward.

Antonelli has had no reason to regret this treatment, nor has he encountered any case in which it was painful. The pain met in a case reported by Leonard he thinks must be entirely exceptional. It is probably due to a rare idiosyncrasy to the drug such as I have noticed and called attention to.²

OPERATION FROM THE NOSE. A method of treating stenosis of the nasal duct, of which we shall hear more in the near future, is described by Passow.³ To gain access to the affected parts he first removes the anterior portion of the inferior turbinate bone. When the healing of the wound thus made is sufficiently advanced a general anæsthetic is given, a probe is passed through the nasal duct, the adjoining parts of the bones are removed with a curved chisel, and the whole length of the duct slit up with a blunt bistoury. Operative treatment of lacrymal obstruction from the nose is by no means a novelty, but Passow seems to have been somewhat more radical and systematic in his procedures. In a certain proportion of cases the obstruction is due to alterations produced by nasal disease at the lower end of the duct, and in these cases no treatment that does not attack these lesions directly is likely to prove entirely effective.

THREAD DRAINAGE. E. A. Pond⁴ has employed the following method: A silver probe, one end of which carries an eyelet threaded with a coarse

¹ *Annales d'Oculistique*, October, 1901.

² *PROGRESSIVE MEDICINE*, June, 1901, p. 384.

³ *Münchener med. Wochenschrift*, September 3, 1901.

⁴ *Medical Record*, February 2, 1901.

silk string, is passed in the ordinary way through the lacrymal sac and duct. When it has reached the floor of the nose the end of the probe is seized with strong forceps and the probe drawn out through the nostril. The silk is then left in the passage, the two ends being tied together to secure it. It is allowed to remain a week or so. A large knot may be tied in it and drawn through to help dilate the passage. Good drainage of the sac has thus been obtained and lacrymal abscess prevented. This suggestion is one that may sometimes be found of decided value, but it is not a method suited to the general treatment of the mass of cases, and one who has never tried to pull a probe out through the nostril might readily underestimate the difficulties.

Lacrymal Fistula. Fistula communicating with the lacrymal passages is generally the result of chronic and severe lacrymal disease. When it fails to close under other treatment it is one of the most widely accepted indications for removal of the sac. Even when congenital it is usually a source of serious annoyance or danger, but this is not always the case. A case is reported by Merlin¹ in which the patient could blow smoke from the nose through an opening, 2 mm. in diameter, in the skin over the upper end of the nasal duct. But the passage was free; there was no epiphora and no evidence of disease of the skin about the fistula, so that the patient declined to have it interfered with.

The peculiar "sore eyes" of the Philippines, it is stated by T. Republica,² are not sore eyes at all, but are cases of lacrymal fistula. These cases give the ordinary history of lacrymal inflammation and obstruction. The destruction of the sac is the treatment looked on with most favor. The actual cautery was employed for this purpose, though acid nitrate of mercury had been used to some extent.

DISEASES OF THE LIDS.

Acute Œdema. Sudden severe swelling of the lids, such as would be expected in connection with severe ophthalmia, but which was not attended with pain or signs of inflammation other than some redness and tenderness of the lid, is reported by de Streville.³ His four cases were all in children of three to seven years of age. One had recovered from an attack of grip, another had symptoms of hereditary syphilis, a third was sometimes affected with urticaria, and the other was in perfect health. The swelling affected the lids of but one eye, came

¹ Wiener med. Wochenschrift, April 13, 1901.

² American Medicine, January 4, 1902.

³ La Clinique Ophtalmologique, February 25, 1901.

on in a few hours, lasted about two days, and was entirely gone by the fourth day. There was no kind of injury, bite of insect, or other cause to account for the attack.

A case is reported by P. Gallois,¹ occurring in a child at the breast and ascribed to cold following overheating. Here, too, there was but a single attack; but he also cites two cases recently reported by L. Gaillard in children of two and three years, in one of which eight attacks had occurred in two years—sometimes on the right, sometimes on the left side, but never on both sides at once. Gallois' second patient was a healthy man, aged fifty years, who for five or six years had suffered from these attacks, which recurred at irregular intervals five or six times a year. The oedema affected either the right side or the left, but not both in the same attack. In this case the swelling usually began with the formation of a small nodule in the lid, firm and slightly tender to touch, and with pain in the head and the visual disturbances of ophthalmic migraine.

Blepharochalasis. This term was applied by Fuchs to a condition that appears to result from repeated attacks of acute oedema of the lid. An example of it was shown by H. M. Starkey² before the Chicago Ophthalmological Society, November, 1901. The patient was a young lady who had suffered such attacks, and noticed the progressive change in the lid for ten or twelve years. The skin of the upper lid hung down, so as to roll over the lashes and impair the vision. It was worse when she was taxing her eyes. In discussing this case, F. C. Hotz pointed out that he had described the condition prior to Fuchs, in 1879. By the repeated attacks of oedema the skin loses its normal connective-tissue attachments to the tarsus, and is allowed thus to sag. It was a case of this kind that had given him the first suggestion of his operation for entropion.

Emphysema. Emphysema about the eye usually is due to injury of the bones containing the upper air-passages, and makes its appearance immediately after such injury; but this is not always so. E. Fuchs³ gives a case in which the infiltration of the tissues followed sneezing thirty-six hours after injury; and he has collected cases in which the interval was much longer; and in a very few cases there has been no history of traumatism. A case in which no history of trauma could be obtained is reported by T. R. Pooley.⁴ There had been three or four attacks preceded by violent sneezing and blowing of the nose. Recovery was rapid under a compress bandage. Fuchs thinks that it

¹ Loc. cit.

² Ophthalmic Record, January, 1902.

³ Ophthalmic Review, May, 1901.

⁴ Archives of Ophthalmology, January, 1901.

is possible to have a diverticulum of the mucous membrane of the air passages extending into the orbit. He mentions an old lady who could, by blowing her nose, cause the protrusion of a large mass from the upper inner angle of the orbit.

Herpes Zoster. Ophthalmic herpes zoster most frequently endangers the usefulness of the eye through involvement of the cornea; but this is far from being the only way in which it may impair the sight. Wilbrand and Saenger¹ discuss its accompanying lesions of the iris, ciliary body and choroid, lens opacity due to it, changes in the intra-ocular tension, disease of the retina and optic nerve, and palsies of both the internal and the external eye muscles.

The direct changes it produces in the lids are of especial importance in their bearing on the diagnosis. To mistake it for erysipelas is a very common error. Cases do occur in which it may at first be difficult to distinguish between the two diseases; but in most instances there is little excuse for the error. W. C. Bane² reports 5 cases, of which 3 had been diagnosed facial erysipelas, and offers the following points of differential diagnosis:

HERPES ZOSTER OPHTHALMICUS.

1. It develops as a bright red inflammation limited to one side of the face, and appears in clusters of firm vesicles on an edematous base that does not spread when once developed.

2. The eruption is preceded for hours or days by severe neuralgic pains, and, as a rule, no fever or rigors mark the disease.

3. The inflammation being of a neurotic origin, it is limited to tissues where the nerve filaments terminate.

4. The inflamed points are exceedingly painful to the touch.

5. Groups of punched-out scars are invariably left in the wake of the vesicles, and remain through life.

ACUTE FACIAL ERYSIPELAS.

1. It develops as a purplish-red inflammation that spreads over all parts, without regard to the median line; the vesicles, when they appear, are in large blebs.

2. It is ushered in by a chill, and marked elevation of temperature, also a burning sensation in the inflamed tissues. A dull headache may be present.

3. The inflammation being due to infection by the streptococcus erysipelatis spreads through the lymph channels, and when deep invades the lymphatic glands.

4. The inflamed tissue is moderately tender to the touch.

5. Seldom is there a trace left after the exfoliation of the skin, though sometimes a thickening of the cellular tissue remains.

Chalazion. The tubercular origin of chalazion is again discredited in the results of experiments by Henke.³ With the contents of 23 chalazia he inoculated 30 animals. The results were negative in every case but 1, in which the patient had been a tuberculous child.

The terminations and sequels of chalazion are discussed by M. F. Weymann.⁴ He finds that these tumors tend to suppurative inflamma-

¹ Neurologie des Auges, Band ii.

² Journal of the American Medical Association, December 21, 1901.

³ Klinische Monatsblätter f. Augenheilkunde, 1901, p. 821.

⁴ Annals of Ophthalmology, October, 1901.

tion, which may result in perforation and spontaneous cure or re-formation. More often they undergo slow erosive degeneration, with formation of fistulous drainage tracks through a gland-duct or a perforation. Variations in the freedom of drainage may cause variations in the size of the tumor. A nipple-like orifice to the Meibomian gland denotes a fistulous track, carrying discharges from a degenerating chalazion. Granulation masses around a conjunctival perforation spring up from the constant bathing in irritant discharges of the same kind. Smooth dark-colored polyps, springing from regions other than that of the inner canthus, result from old chalazial drains.

Stagnating secretions in fistulous ducts may soften the intervening tissue, and irruptions into healthy glands may take place until the whole cartilage is furrowed and honey-combed. This last result Weymann¹ has discussed under the name of *Tarsadenitis Meibomica*, of which he has encountered 4 cases. The general swelling of the lid may simulate trachoma; but there is less inflammatory disturbance. The patient does not complain of pain, but, on question, admits discomfort from light or dust, and insists mainly on smarting and itching. A pathognomonic sign is the alligator-leather appearance of the conjunctiva covering the cartilage. This, too, suggests trachoma in its papillary form. The raphe-like depressions between the glands should prevent error. The nipple-like orifices of the Meibomian ducts, from which the discharge may exude, but which cannot be squeezed or wiped away, are highly diagnostic.

The treatment includes free opening of fistulous tracks, cleaning them, and expelling their contents by pressure, scraping, and injection of a 5 per cent. protargol solution.

Adenoma of the Meibomian Glands. Cases of this character are reported by H. Knapp² and C. A. Wood.³ Knapp's patient was a woman, forty-eight years old. The lid was thickened and nodular. The tumor was hard, like cartilage, and yellowish-white, like old ivory. The skin over it was thin, elastic, and movable. After partial excision, followed by increase of the tumor, the entire tarsal portion of the upper lid was taken away. No relapse had occurred four months later.

Wood's case was in a healthy girl, aged six months. The tumor, then the size of a buckshot, had been first noticed when she was a week old. It was now the size of a butternut, involving the whole lid. The skin covering it was deeply pigmented. The growth felt soft and spongy. Firm pressure reduced its size, so that it was regarded as a cavernous angioma. Removal and microscopical examination revealed

¹ Journal of the American Medical Association, November 16, 1901.

² Transactions of the American Ophthalmological Society, 1901.

³ Ophthalmic Record, November, 1901, p. 610.

that it was composed of structures closely resembling the Meibomian glands. A similar growth the size of a small bean was also removed from the upper lid. Healing was uninterrupted. Knapp has collected previously published reports of seven cases.

Gangrene of the Lids. Last year I collected¹ several cases of destruction of the lids by different processes that could be grouped under this head, to which may now be added five others. Under the title "Noma of the Eyelids in an Infant" F. W. Marlow² reports the case of a child emaciated from indigestion during the first two weeks of life. About the end of the first week there was a thin discharge from the conjunctiva and swelling of the lids of the right eye. A pimple formed on the skin surface of the upper lid, became pustular, broke down, and formed an ulcer, which rapidly extended until, two weeks later, there was complete destruction of both lids. When seen at this time the edges of the ulcers were sharply defined, somewhat undermined, and with a narrow zone of dusky, congested skin. The cavity was partly occupied by dark greenish pus and dirty, soft slough. Later the cornea perforated, but the cavity contracted somewhat and cicatrized around its margins. The child, however, gradually became weaker, and died when about three months old. Marlow has also seen destructive ulceration of the lid, following an illness thought to be diphtheria, in a boy aged five years.

A case of somewhat different character is reported by Roger and Weil.³ The patient was a previously healthy man, aged thirty-three years. His trouble began with an area of redness and swelling of the lid, which continued to increase for two days before general symptoms were noticed. At the end of a week he came to the hospital with the whole side of his face swollen, hard, and painful. On the lids were regular, dark, gangrenous areas bathed in pus. His temperature rose to 103° F. The neighboring lymph glands were not swollen. In three days his temperature was normal; then the local condition improved rapidly, and a month later scarcely a trace of the lesions of the lids remained.

V. Morax⁴ reports two cases very similar to the one just given. One occurred in an infant aged nine months, the other in a man aged forty-four years. Both ended in recovery, with surprisingly slight scars.

In these three cases bacteriological examinations were made, but with no very definite results. A. Terson⁵ reports a case of gangrene of the lid in a woman, aged eighty-five years, with good recovery.

¹ PROGRESSIVE MEDICINE, June, 1901.

² Ophthalmic Record, December, 1901.

³ Presse Médicale, September, 1901.

⁴ Annales d'Oculistique, January, 1902.

⁵ La Clinique Ophtalmologique, January 25, 1902.

Roger and Weil propose for such cases the name "benign gangrene of the lids." Morax emphasizes the point that neither in their case nor in his was there any odor of putrefaction. The lesions are probably due to some aërobic organisms. The extremely rare cases of putrid gangrene of the lids, of which Marlow's case is probably an example, are presumably due to anaërobic organisms. To cases of this latter class Morax would restrict the term gangrene, making its employment as regards lesions of the lids uniform with its employment as to lesions of other parts of the body. For the milder, non-putrid cases with favorable prognosis he uses the term necrosis. Apparently some such distinction should be made; and perhaps it will be well to emphasize the fact that some of these necroses are clearly secondary to some other well-recognized disease, while in others the gangrene seems to be a leading symptom in a disease *sui generis*.

Ptosis. Ptosis due to complete loss of power in the elevator of the upper lid has usually been corrected by bringing the lid under the influence of the occipitofrontalis muscle, commonly by taking tissue up from the lid to the frontalis tendon, as in Panas' operation, or by connecting the muscle and the lid by a buried suture or a scar. The plan of carrying the frontal tendon down to the lid has been used by F. Fergus.¹

He makes a horizontal incision in the eyebrow, extending its full length. Through this single incision the skin is separated from the fascia and tendon of the frontalis upward nearly two inches. Downward the skin and portions of the muscle are separated from the tarsus, the division being carried almost to the free margin of the lid. A strip of the frontalis tendon—a vertical band three-quarters of an inch wide and two inches long—is then marked out and dissected up from underlying structures until its only attachment is to the frontalis muscle at the part furthest from the skin incision. The free end of this band is then drawn down to the lid and secured by catgut sutures as near the lid margin as possible.

The single skin incision, being quite concealed by the eyebrow, may give the Fergus operation the advantage he claims, of leaving less visible scarring than any other operation of its class; but any operation of this kind must cause the obliteration of the deep fold that normally exists between the lid and the brow. True, this fold is already practically obliterated in cases of paralytic ptosis, but this operation does not restore it. The obliteration of the fold is not so marked after operations that seek to attach the lid to the upper margin of the orbit, but it is best conserved or restored by the operation of Motais.

¹ British Medical Journal, March 30, 1901.

This operation seeks to attach the lid to the muscle that acts most constantly and exactly in association with the elevator of the upper lid, the superior rectus. The tendon of the superior rectus is exposed and the conjunctival incision extended forward to the upper margin of the tarsus. A strip of the tendon—its central portion, 3 or 4 millimetres broad—is separated from its normal insertion and from the strips on either side of it. A suture with a needle at each end is passed through this strip, and the needles introduced at the posterior margin of the tarsus carried forward toward the lid margin and brought out through the conjunctiva. The suture when tightened draws forward the isolated strip of rectus and attaches it to the tarsus. The conjunctival incision may be closed over the tendon strip in its new position by a transverse suture. The sutures are removed at the end of a week.

This procedure has recently been the subject of most favorable comment on the part of French surgeons who have tried it. Laurent¹ reports most gratifying success with it in a case of bilateral hereditary ptosis, and speaks of it as one of the happy triumphs of contemporary surgery. It is the only operation which renders the movements of the lid physiological and its aspect normal.

Morax reported to the Paris Ophthalmological Society² a case in which he did Motaïs' operation for ptosis caused by chancre, which had been opened on the supposition that it was an abscess. The lid was thick and heavy, and the improvement wrought by the operation seemed at first slight; but the movement of the lid gradually improved until the power of elevating it had increased from 15 degrees to 55 degrees, and the result was very satisfactory. Laurent's patient also had thick, heavy lids.

Morax modified the operation by bringing the ends of the suture out upon the skin surface of the lid and tying them over a little roll of cotton. He found this easier, and it avoided the danger of ulceration of the cornea from rubbing by the threads. Pechin³ states that after several operations by the method of Motaïs corneal ulcerations have occurred. Such ulceration occurred in one eye in Laurent's case. Motaïs in discussing the case reported by Morax stated that by using very fine, soft silk he had avoided producing any corneal ulceration, but he admitted that the skin suture was easier and would give the same result.

Sulzer⁴ was interested in the gradually developed power of the rectus muscle to elevate the thickened, infiltrated lid. Abadie had practised

¹ *Annales d'Oculistique*, December, 1901.

² *Recueil d'Ophtalmologie*, November, 1901.

³ *La Clinique Ophtalmologique*, October 25, 1901.

⁴ *Recueil d'Ophtalmologie*, November, 1901.

the operation of Motais with apprehension. He feared that weakness of the superior rectus would cause annoying diplopia. This fear proved not to be well founded. Although there actually was some diplopia during the first fortnight, this in the end entirely disappeared.

Morax notes that the physiological tendency of the eyeball to rotate upward with voluntary closure of the lids caused a slight elevation of the upper lids when the attempt was made to close them forcibly. On this account one should be very cautious about excising any of the skin of the lids in connection with this operation. He had at first thought of doing this in his case, but had dismissed the idea.

DISEASES OF THE ORBIT.

Exophthalmos. A case of displacement of the eyeballs by slowly developing osteoporosis is reported by P. N. K. Schwenk.¹ The eyes had been pushed downward and forward until they were actually dislocated from the orbit. The corneas were no longer fully covered by the lids, and their transparency was impaired. The right eye was pushed below the lower margin of the orbit. The optic nerves were partially atrophic from stretching and pressure. Vision was greatly reduced. The general appearance of the patient is shown in Fig. 27. In this case the abnormal growth had continued fifteen years, at first rapidly, then more slowly. It commenced soon after a fracture of the lower jaw, before the patient was eighteen years old.

Meningocele. Tumor of the orbit due to intrusion of the cranial contents, usually the membranes and cerebro-spinal fluid, is commonly described as appearing at the upper inner angle of the orbit during infancy. Its appearance in other parts of the orbit is illustrated by a case reported and figured by J. Talko.² Then it may come under observation only when the patient has reached adult life, and the evidence proves insufficient to furnish the basis of a correct diagnosis. This was true of cases reported by W. Ereklentz and Lagleyze.³

The patient of the former presented a pulsating exophthalmos, which was ascribed to aneurism of the ophthalmic artery. The patient died of other diseases. At the post-mortem examination a large opening was found from the middle fossa, through the greater wing of the sphenoid, into the outer back part of the orbit. Through this the meninges distended with fluid, pushed into the orbit, transmitting the cerebral pulsation directly to the eyeball.

¹ *Annals of Ophthalmology*, April, 1901.

² *Recueil d'Ophtalmologie*, April, 1901.

³ *Archives d'Ophtalmologie*, December, 1900.

The patient of Lagleyze was a woman of twenty-one years. The eye, which still retained one-fourth vision and a limited horizontal movement, was pushed out beyond the edge of the orbit. Pressure reduced the exophthalmos to some extent ; but there was no pulsation and no fluctuation. Operation on the tumor revealed a cystic protrusion into the orbit, through an opening in the orbital roof, in which the brain pulsations could be felt. The patient survived the operation, and two

FIG. 27.



months later the eyeball and other orbital tissues were removed to lessen the deformity, without again attacking the meningocele itself.

Besides meningocele the condition most likely to cause a large cystic tumor of the orbit at birth is anophthalmos or microphthalmos, with the large cyst that often accompanies it. In Talko's case the diagnosis of meningocele was based on the fact that the eyeball was present in the affected orbit and was well developed, excluding microphthalmos. The microscopical examination of fluid drawn from the sac with the

hypodermic syringe is often recommended as the basis for a diagnosis ; but this was resorted to by Lagleyze without preventing the mistake that was made.

Anophthalmos. This deformity is sometimes ascribed to instrumental delivery or some neglect on the part of the physician or midwife. J. H. Claiborne¹ reports a case in which there was some difficulty attending the delivery, and the physician and midwife themselves thought possibly the eye had been destroyed in the process. Examination showed, however, that the eye was either congenitally absent or had been destroyed during intra-uterine life.

L. D. Brose² reports a case of congenital absence of the right eye, while the left eye was the size of a large pea, having a small transparent cornea, but no opening in the iris. The paternal grandfather of the child was born without a right eye, but saw perfectly with his left. There was also a history of mental shock to the mother during the second month of pregnancy. In another case reported by Claiborne there was a history of fright by lightning at the beginning of pregnancy, and a severe mental shock at the end of two months. In this case both eyes were absent or so rudimentary that their presence could not be detected. There was also very imperfect development of the palpebral fissure. The aperture of the right nostril was the size of a large knitting needle, and the left nostril was imperforate. The auricles were defective, and there were supernumerary auricles on both sides. The child when two months old was marasmic, and died two weeks later.

The autopsy of a case of congenital unilateral anophthalmos is reported by C. Zimmerman.³ The patient, aged forty-one years, died from fracture of the skull. On removing the roof of the orbit and following forward the thin band which represented the optic nerve, this was found to terminate in a small mass of fibrous tissue, just like the sclerotic, of the size of a pea, which showed in its interior a small amount of black pigment—a rudimentary eyeball containing only remnants of sclerotic and choroid. In this case, too, the auricle of the affected side was deformed, and the olfactory nerve and bulb of that side were absent. The oculomotor nerve of that side was about one-half the size of its fellow. The presence and functional activity of the ocular muscles had been demonstrated during life by the movements of the conjunctival sac in all directions in association with the movements of the other eye.

In none of these cases of anophthalmos and microphthalmos was there any cyst in the orbit. In Zimmerman's case, as in the case of

¹ Transactions of American Ophthalmological Society, 1901.

² Archives of Ophthalmology, January, 1901.

³ Loc. cit.

meningocele that came to autopsy, there was marked asymmetry of the skull. In a case reported by W. G. Spiller¹ there were neither optic tracts, chiasm, or optic nerves, and even the optic foramen was absent.

Spontaneous Hemorrhage in the Orbit. V. Morax² has reported a case of sudden exophthalmos in a man aged sixty-eight years. The protrusion was in the axis of the orbit. It was not reducible by pressure. It was accompanied with complete external ophthalmoplegia, and there was no disturbance of the retinal circulation. The patient was not suffering from any special disease; but he seemed cachectic, and looked much older than he was. He had been subjected to attacks of headache, which terminated often by an abundant epistaxis. There was some pain in the region of the eyebrow. Two days later the protrusion of the eyeball rapidly subsided, and the ocular movements were restored. This rapid recovery casts some doubt on the explanation of the symptoms as caused by orbital hemorrhage; but the irreducible character of the protrusion seems to support it.

No such question can be raised, however, in regard to a case of hemorrhage into both orbits in an infant reported by C. D. Conkey.³ The child had been delivered after a normal easy labor at full term, and was apparently healthy. On the third day the upper lids became distended with extravasated blood, and there were hemorrhagic spots beneath the conjunctiva. Two days later there was marked exophthalmos of both eyes. This continued to steadily increase on the right side for the next ten days until the right eye was crowded entirely out of the orbit. The pressure seemed to be exerted from above, the eye being forced down and out. Vision did not seem to be impaired; the pupil remained normal, and responded promptly to light. After the time mentioned the hemorrhage ceased, and the eyes gradually receded into the orbits. In addition to the orbital hemorrhage there was continued oozing from the umbilicus for a week; and there was evidence of blood in the urine.

Hemorrhage into the orbit has been occasionally reported in young children; but they have been older than this one, and they were suffering from scurvy from improper feeding. Conkey suggests some such condition in his case following immediately after birth, but speedily relieved by an abundance of good milk. There was no history of hemophilia.

Tumors of the Orbit. TUMORS OF THE OPTIC NERVE. These have been especially studied by W. G. M. Byers,⁴ who would class them as intradural, corresponding to the "true" or "genuine" of Leber,

¹ University of Pennsylvania Medical Bulletin, February, 1902.

² Recueil d'Ophthalmologie, April, 1901.

³ Ophthalmic Record, October, 1901.

⁴ Studies from the Royal Victoria Hospital, Montreal, August, 1901.

and the extradural, or so-called "false" tumors of the nerve. He tabulates the reports of 102 cases, including 2 studied by himself. The distinguishing signs of primary tumors of the optic nerve are: exophthalmos, painless and slow in development, and tending somewhat to coincide with the axis of the orbit. Profound and early reduction of vision, often greater than the marked ophthalmoscopic changes of the optic disk would indicate. A tumor in the position of the optic nerve non-adherent to the orbital wall, and revealed by bulging or deviation of the globe, or by palpation under an anæsthetic. Relatively good movement of the globe, impairment of muscles being infrequent. Hyperopia, from pressure of the tumor on the posterior surface of the globe.

Byers finds in a very large percentage of cases that the primary intradural tumor of the optic nerve constitutes but part of a neoplasm, more or less widely affecting other structures within the skull. These tumors do not correspond to any single type. We have constantly represented in the same specimen several phases of developing connective tissue. He would indicate the morbid condition as *fibromatosis*. Death in these cases, he thinks, is never due to the spreading backward of the orbital tumor, but to the continued growth of an intracranial portion of the neoplasm, which is not removed at the time of operation.

ANGIOMA OF THE ORBIT. Even when probably of congenital origin, a tumor of this character may not be apparent immediately after birth; and many cases are apparently of quite different origin, and arise in later life. Of the cases reported last year, one, treated by Fromaget and Debédât,¹ was first noticed when the child was one month old. It grew quite slowly at first; but at two and a half years suddenly increased to the size of a chestnut. It was treated by electrolysis. The positive pole, insulated by varnish to prevent action at the point of penetration, was plunged into the tumor, contact with the negative pole being through a broad electrode. A current of 25 to 30 milliamperes was passed for three or four minutes. This application of the current was repeated ten times at intervals of about a month. In two months the swelling was gradually diminishing, and after six months it had quite disappeared.

A case of *angiofibroma* reported by Parinaud and Roche² came under observation in a woman, aged twenty-eight years, two years after exophthalmos had first been noticed. Its subsequent progress was watched for over six years, during which time it gradually increased in size, accompanied by an increasing hyperopia, and slight diminution of vision. It was then removed by the method to be discussed below.

¹ Recueil d'Ophthalmologie, March, 1901.

² Annales d'Oculistique, October, 1901.

and was found to have reached the volume of a walnut, 3 centimetres in diameter.

A *carcinomatous angioma*, 5.4 cm. in its longitudinal and 3.7 cm. in its greatest transverse diameter, was removed by A. L. Whitehead¹ from the orbit of a man, aged fifty-one years, who had noticed the protrusion of the eye for about ten years. There had been no pain or discomfort until within a few days when ulceration of the cornea had arisen from exposure through incomplete closure of the lids. The eye was restored to almost perfect vision.

A *venous angioma* was removed from the orbit of a man, aged fifty-seven years, by Frogé and Baulai.² The tumor had been noticed four or five years, and had been preceded by several severe traumatism of the orbital region. Electrolysis was tried without benefit. The growth had reached the size of an orange, and extended out upon the cheek beside the nose. It was removed with the eyeball; but a portion of it was found to extend into the cranial cavity through the sphenoidal fissure. The patient died on the tenth day after the operation, apparently of an embolism, which is ascribed to his imprudence.

Kroenlein's Operation. The plan of reaching the deeper contents of the orbit by displacement of a portion of its outer wall as an osteoplastic flap grows in favor with operators. It has been resorted to³ in more than 50 cases, and the only death occurred in a case of tumor extending into the cranium, and, therefore, not capable of complete removal. As originally suggested by Kroenlein, the operation begins with a curved incision, convex forward and downward, beginning above the upper outer angle of the orbit, passing downward close to the external canthus, and back to the middle of the zygoma. A periosteum elevator is then introduced between the periosteum of the outer wall of the orbit and the bony wall, and the periosteum is loosened from the bone over the whole part of the orbital wall, which is to be included in the flap. The periosteum and orbital contents are then held away from the bone, and three bone sections are made. The first is horizontal, runs back from the upper outer angle of the orbit, and divides the external angular process of the frontal bone, extending through that part of the orbital wall that separates the orbit from the temporal fossa. From the posterior end of the first the second incision extends downward and rather backward to the sphenomaxillary fissure. The third incision passes horizontally backward from the lower outer angle of the orbit, through the frontal process of the malar bone, ending also in the sphenomaxillary fissure. The flap of bone thus isolated is then, with

¹ British Medical Journal, April 13, 1901.

² La Clinique Ophthalmologique, July 10, 1901.

³ Ophthalmic Review, January, 1901.

the attached soft parts, pushed back upon the temporal region ; and the periosteum, being slit up, the contents of the orbit are exposed. The further steps depend on the object to be accomplished by the operation ; but in most cases it has been necessary to divide the external rectus. At the close of the operation the bone flap and attached soft parts are brought into position, and, retained by stitches, some of which should pass through the periosteum. Some kind of efficient drainage should be provided for the first few days.

The operation is especially indicated for all sorts of retrobulbar tumors, retrobulbar injuries, with serous infection, or the lodgement of a foreign body deep in the orbit ; and even the removal of orbital tissue in exophthalmic goitre, and the increased facility in certain operations on the posterior segment of the eyeball or the optic nerve have been named as justifying it. Aside from obtaining more space to work in and a clearer view of the parts than is possible when the orbit is entered from in front, the great advantage claimed for Kroenlein's operation is that it causes less injury or disturbance to the globe of the eye. This claim has been borne out by the recorded experience in regard to it. Not only is the eyeball saved, but such vision as it possesses at the time is preserved, and shrinking of the globe, which follows in many of the cases operated on from in front, seems to be avoided.

Byers¹ finds this operation especially suited to the removal of tumors of the optic nerve, because it allows the removal of the greatest possible portion of the growths that extend backward, and because it does not expose the deeper parts of the orbit to infection by the pathogenic organisms that are found in the conjunctival sac. Kalt² reports the removal of an encysted tumor from within the cone of muscles by this operation. The tumor was the size of a walnut, and had appeared quite suddenly four years before. It was found not to contain fluid, however, but small tumors of fibrous consistence. Healing was complete in eleven days ; but the lateral movements of the eye, previously somewhat limited, were not improved by the operation.

Kroenlein's operation has been employed, with an important modification, by Parinaud and Roche.³ Instead of the curved incision convex forward, they began with a vertical incision, 4 cm. or 5 cm. long, and about 5 cm. back from the external margin of the orbit, the hair having been shaved from the field of operation. From the upper and lower ends of this first incision horizontal incisions were carried forward, the lower to the lower angle of the orbit, the upper into the eyebrow.

¹ Studies from the Royal Victoria Hospital, Montreal, August, 1901.

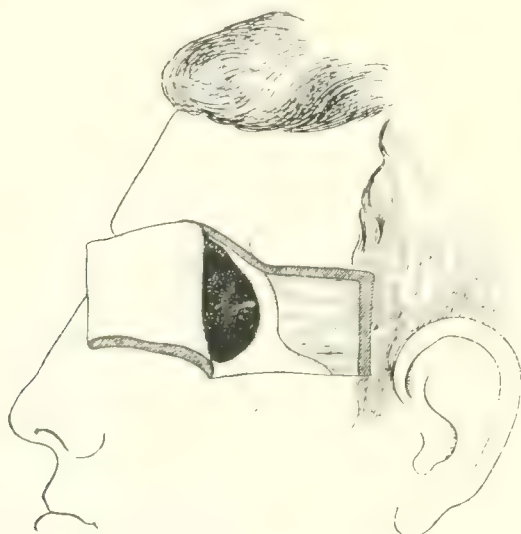
² *Annales d'Oculistique*, January, 1902.

³ *Ibid.*, October, 1901.

The skin and underlying tissue down to the temporal fascia was then dissected up and this flap turned forward, exposing the outer margin of the orbit, as shown in Fig. 28. After this the bone flap was separated in the usual manner and reflected back with the temporal fascia and muscle attached to it.

The advantages claimed for this modification are that it leaves a less conspicuous scar, one not noticeable from the front, and that it keeps the operative wound still farther removed from the secretions of the conjunctiva. Of the skin incisions the vertical one is entirely hidden by the hair when this grows again, and the anterior portion of the upper one is similarly hidden by the eyebrow, while the lower one is quite inconspicuous along the upper margin of the zygoma. On the other hand, these incisions divide vessels that will require ligature, and

FIG. 28.



Anterior flap of soft parts for Kroenlein's operation.

disturb, to a greater extent, the nutritive supply of the parts, and there are two flaps to be taken care of instead of one. In the case reported, however, the result was in every way satisfactory, healing being complete within eight days, by first intention.

A case of exophthalmos cured by a modification of this operation, without knowing just how, is reported by Rollet.¹ The patient, a man aged forty-two years, had suffered for three years with very severe headaches. There was protrusion of the eye. Upward and outward movements were totally abolished. There remained slight movement down and in. There was complete ptosis and some chemosis. There was some optic neuritis, but the eye-ground was otherwise normal. There was no pulsation. The symptoms grew worse under medicinal

¹ *Annales d'Oculistique*, November, 1901.

treatment. Malar orbitotomy, as Rollet calls his operation, was done. The depth of the orbit was carefully examined by sight and touch, but nothing abnormal was discovered. However, after the operation the patient was free from pain, and improved gradually in all respects. Within six months he had regained forty-six pounds' weight lost during his period of headache. He had no pain or exophthalmos; ocular movements were normal or very slightly limited laterally, and the ptosis was very slight. Rollet employed an operation differing from Kroenlein's in this. He separated the malar bone with the chisel from its superior and posterior attachments, and dislocated it down and out instead of turning a flap back toward the ear. This gave him room to examine the depth of the orbit without division of the external rectus.

Preparations for Prothesis. PARTIAL REMOVAL OF EYEBALL. After amputation of the anterior segment of the eyeball (abscission, keratectomy) the purse-string suture of the conjunctiva may give a very satisfactory result; but it often fails to do so, because the tension is too great for the loose tissue in which the suture has to be placed. F. Lagrange¹ proposes to remedy this by suturing the recti muscles over the front of the globe, beneath the conjunctiva.

After the conjunctiva has been divided all around the corneal margin and loosened from the sclera well back of the muscular insertions, each rectus tendon is lifted on a hook, a suture passed through it, and the tendon divided close to the sclera. The purse-string suture is then introduced, and the desired part of the anterior segment of the eyeball is cut off. The purse-string suture is then drawn up, with the four sutures attached to the four tendons hanging from the opening. As the last step these threads are drawn upon, pulling their respective tendons forward to reinforce the conjunctiva, and cover in securely the vitreous. The adjustment of the tendons is watched through the semi-transparent conjunctiva, and the sutures attached to opposing tendons are tied together. To avoid confusion the threads attached to the lateral tendons are black and those attached to the superior and inferior tendons white.

To get rid of all dangerous portions of the eyeball, while keeping all parts that can be of service, J. G. Huizinga² has suggested opening the globe by an incision starting just below the insertion of the external rectus and running back to the optic nerve. Through this opening the contents of the eyeball are to be removed, and a circular piece of sclera, including the entrances of the optic and ciliary nerves, is to be excised. A fenestrated metal ball is then to be introduced within the sclera and

¹ *Annales d'Oculistique*, February, 1902.

² *Annals of Ophthalmology*, April, 1901.

the incision closed with catgut sutures. This operation has been tried upon the eyes of dogs, and its proposer thinks that by tattooing the cornea sufficiently good cosmetic effects can be secured without the wearing of an artificial eye. While such an operation is intended to remove all dangerous parts of the eyeball, so little is known about the pathology of sympathetic inflammation that only a very large experience could establish the safety of the method.

A measure that comes to us with a better probability of safety is evisceration brought scientifically up to date by supplementing it with the use of the actual cautery. Lapersonne,¹ after making a free corneal incision, and allowing the pus to escape and the lens to be removed, introduces the actual cautery into the eyeball. The galvanocautery is preferred. It must have a large blade, and should be curved on the flat to about the curve of the sclera. This is introduced at white heat, and reintroduced until the sclera is thoroughly cleaned. The charred debris is then washed out with some antiseptic solution, the globe dusted with iodoform, and covered with a simple dressing. Pain is relieved at once, and the globe shrinks to a small, but regular, painless and probably safe stump.

INJECTIONS TO FORM A STUMP. The results reported by Gersuny of the injections of vaseline in other parts induced Rohmer² to try them for the formation of a better stump for the support of an artificial eye. The vaseline was thoroughly sterilized by boiling, the glass syringe employed was sterilized and warmed, and the needle passed through a flame. Under local anaesthesia about one cubic centimetre was injected some 5 mm. beneath the surface of the scar left by enucleation. When this proved not to be sufficient additional quantites were injected after intervals of a few days. The cosmetic results thus attained were very satisfactory. The deep crease usually seen above an artificial eye was obliterated and the movement of the prothesis increased. The plan has also been tried successfully by Dianoux;³ but neither of these surgeons has watched the results attained by this method long enough to judge of their permanence.

An effort to secure an improved stump by the injection of agar-agar was made by G. F. Suker,⁴ who reports twelve experiments on dogs and rabbits. The injections were made both into the emptied sclera and into the capsule of tenon after enucleation; but, as with other absorbable materials, the results, although at first promising, were not sufficiently permanent to warrant any recommendation of the method.

¹ Archives de Ophthalmologie, January, 1901.

² La Clinique Ophthalmologique, February 25, 1901.

³ Ibid., August 10, 1901.

⁴ Ophthalmic Record, September, 1901.

IMPLANTATION OF GOLD BALL IN THE ORBIT. The difficulty about implanting a globe of glass or metal in the orbit to serve as the support of an artificial eye has been that in a large percentage of cases the ball was forced out or displaced to one side, where it prevented instead of helped the wearing of an artificial eye. To avoid this difficulty L. W. Fox¹ makes the incision for the insertion of the ball not in the line of the pressure that tends to force it out, but in the lower nasal part of the conjunctival sac, where it will be supported by the lower lid. In the part that will have to resist the forward pressure the tissue is left undisturbed. To prevent the ball from being pushed aside from its proper position Fox employs a "conformer." This is a shell, to be worn as an artificial eye for a time, in which is a circular opening that fits over the embedded globe and prevents its lateral displacement. Fox prefers a gold ball to those of silver or glass.

IMPLANTATION OF RABBIT'S EYE. The widely heralded attempts to implant the eye of a rabbit in the human orbit have generally ended in complete failures. Rohmer first used vaseline injections (see above) in a case of the kind. F. Lagrange,² however, claims that in eleven attempts he has succeeded ten times in getting the rabbit's eye retained permanently when inserted, as he does it, after ordinary enucleation. He publishes a photograph of the first of these successful cases, taken after fourteen months, and it shows a very good stump for the support of an artificial eye.

His plan is, when enucleating an eye, to insert a thread in the tendon of each rectus muscle. After enucleation hemorrhage is arrested by the use of ice-water, hydrogen dioxide, or tamponing for a time; but it must be arrested. The eye of a young rabbit, of medium or small size, is then enucleated and placed in the capsule of tendon previously prepared for it. The recti tendons are then drawn over it and sutured in pairs with fine silk or catgut; then over the whole the conjunctiva is closed with interrupted sutures, usually four in number. The eye is then covered with an occlusive dressing. The conjunctival sutures are removed at the end of the first week. Every step in the operation, including the enucleation of the eye of the rabbit, must be taken with strict antiseptic precautions.

At first the transplanted globe softens and loses almost one-third of its volume, then its condition becomes stationary; and since this stationary condition has lasted more than a year, Lagrange believes that it is a permanent condition. The prosthesis thus obtained he thinks very superior to the ordinary prosthesis.

¹ New York Medical Journal, January 18, 1902.

² Annales d'Oculistique, March and November, 1901.

DISORDERS OF THE OCULAR MOVEMENTS.

Anomalous Diplopia. Cases of anomalous or reversed diplopia are occasionally encountered. Usually after an operation for strabismus, with an apparently good result, diplopia will appear and may prove very troublesome, just as it would be expected to appear if the eyes had previously been straight and the operation had caused them to deviate in the direction opposite to that which they previously took. Or after the incomplete correction of a strabismus, or during the investigation of a case prior to any operation, it is found that the diplopia elicited is the opposite of what would naturally be expected. A case of this kind is reported by G. C. Harlan,¹ and in discussing it others were mentioned by W. Zentmayer, S. D. Risley, F. Fisher, and C. A. Oliver.

Such cases have often been reported under the title of "false macula" or "vicarious fovea"—terms that may be readily accounted for, but which are misleading. The macula and fovea are regions of the retina, characterized by position, structure, and appearance. The false "macula" or "fovea" is one that has not this characteristic position, and there is not the slightest reason for supposing that it ever resembles the true macula or fovea in peculiar structure or appearance. The use of the terms macula and fovea tend to fix attention on the retina; whereas the real characteristic of these cases is an anomalous co-ordination of brain centres concerned with visual perception and ocular movement, and has nothing to do with the retina. Out of this loose speaking about a function of co-ordination as if it were a function of a limited part of the retina seems to have arisen a recent discussion.

F. H. Verhoeff² argues against the theory of the "vicarious fovea" on the results obtained in a case of the kind which he reports. His patient, a medical student with perfect vision in each eye and ability to fix with either, had a convergent strabismus of 25 centrad; but prisms of this strength, base out, produced the most annoying diplopia, and other subjective tests indicated orthophoria. Careful tests seemed to show that diplopia was ordinarily avoided in this case by suppression of one image rather than by binocular fusion, that there was no perception of stereoscopic relief, and that the position of the so-called vicarious fovea was not constant.

On the other hand, A. E. Davis³ reports four cases in support of the theory of a "vicarious fovea," as he understands it. Two of these are of special interest, because after operation, when the eyes were first left open, three images were seen. One image belonged to the fixing

¹ Ophthalmic Record, April, 1901.

² Ibid., June, 1901.

³ Ibid., September, 1901, and January, 1902.

eye, one was a reference of the image in the other eye to the true point of fixation, and a third as reference of the image to that part of the retina supposed to have been used for a false fixation while the eye deviated. This triplopia speedily disappeared—in one case after the second day, and in the other by the end of the first week.

It would appear that in so far as it is possible to prove a negative by a single case Verhoeff has proved that no other part of the retina can have established with it all the associations and co-ordinations that are usually established in connection with the fovea of the normal eye. It would be contrary to all analogy if that were so. But, on the other hand, the cases reported by Davis go with a great many others, including Verhoeff's, to show that some of these associations and co-ordinations are sometimes established with other parts of the retina.

Advancement Operations. Many surgeons have used the operation of advancement of the insertion of a rectus muscle only as a means of increasing the effect of a tenotomy of the opposing muscle. The greater extent and complexity of an advancement operation have kept operators familiar with tenotomy from undertaking the newer method ; but without doubt a better appreciation of what is to be aimed at in a muscle operation, and a greater sense of responsibility for the ultimate results of a squint operation, will bring about a more general resort to advancements.

H. W. Wotton,¹ following the lead of Landolt, urges that advancement without tenotomy ought to be at least the primary operation in most cases of strabismus, and certainly in those cases in which the difference in visual acuity between the eyes is not so great as to render the re-establishment of binocular single vision practically impossible. His strong point in favor of advancements is that they do no harm, and to anyone who has seen many cases of tenotomy long after the operation, this argument will appeal strongly. As Wotton says, "Tenotomies as primary operations, particularly in convergent cases, are at best hazardous procedures. Apparent parallelism for the time being is frequently obtained, but almost always with great sacrifice of the power of convergence. In general, however, even this parallelism is merely apparent ; binocular fixation is not really present, and in the few cases in which binocular single vision is found to exist it is frequently subsequently lost." This is a vigorous indictment to bring against a widely practised operation, though there is too much reason for it ; but it does not prove that advancement will do all that tenotomy has failed to do, and something may be said on the other side.

Tenotomy. In a discussion at the 1901 meeting of the American Medical Association F. C. Hotz urged that we should not throw over-

¹ Archives of Ophthalmology, May, 1901.

board an operation which has its good points because of some bad results. In convergent strabismus the occurrence of alternating strabismus and the results of non-operative treatment show that it is the internus muscle, and not the externus, that is at fault. It certainly is not rational to leave the faulty muscle alone and produce an abnormal condition in the normal externus.

But this reasoning might be pushed a step farther. Primarily neither muscle is at fault; they are both forced into faulty action by the nervous mechanism that controls them. It is irrational to render either of them abnormal. Still, since we cannot always change the faulty co-ordination that causes the squint it is sometimes proper to modify the action of the muscles which can be reached; and this may be done sometimes by tenotomy as properly as by advancement. It should be remembered in both cases that we are not dealing directly with the original cause of the trouble, and the appropriate caution should always control such operations.

Treatment Other than Operative. Just what is appropriate caution in a given case may be rather hard to define; but a good standard was furnished, in the discussion above mentioned, by J. L. Thompson, who said of squint cases, "Now I never operate on them until I think and talk it over with them for a year." Such a period need not be occupied exclusively with thinking and talking; it may be well spent in treatment other than operative. I have urged¹ that three-fourths of this is the early and accurate correction of ametropia. This will cure more cases of strabismus than any operation, and cure them in a higher sense of the word, and more permanently. To it must be added the correction of vicious methods of using the eyes and the training them to see together.

These latter require the utmost patience and persistence. It must not be expected that faulty habits of innervation can be overcome with less time and less practice than has gone to establish them. The methods of real practical value are those that can be applied day after day for considerable periods in the patient's home—such as the occlusion of the better eye, the use of a cycloplegic, the reading bar that compels the use of both eyes, and the ordinary stereoscope with a large series of appropriate pictures to cultivate binocular fusion.

Alternating Strabismus. J. M. Ray² calls attention to the greater difficulty in correcting this form where the visual acuteness is about equal in the two eyes. He finds that in these cases tenotomy is less effective, and a smaller proportion of them are relieved by glasses.

¹ Journal of the American Medical Association, October 26, 1901.

² Ibid., November 2, 1901.

REFRACTION AND ACCOMMODATION.

Myopia. During the last year myopia has been the subject of two very notable and important discussions—one opened by Priestley Smith, before the Section of Ophthalmology of the British Medical Association,¹ the other, opened by Pfalz,² before the German Ophthalmological Congress. It is true that these discussions brought out little that was new to the American literature of myopia. Their prototype might be found in the discussion which took place ten years ago before the American Ophthalmological Society.³ But more convincing evidence has been produced than ever before, and the conservative sources from which it comes will give it great weight in establishing certain points that have been too long disputed.

Smith showed by a chart the changes in the amount of myopia occurring in one hundred cases observed for periods of five years or longer in his private practice. He holds that no line can be drawn between the innocent and the pernicious myopias. The younger the patient the more likely that the myopia will increase. In all of his cases it increased up to the age of thirteen years. The higher the degree of myopia the more likely is it to increase. Of thirty-six cases having myopia of 10 D or upward only three showed no tendency to increase at any time, and in only seven did the increase seem at any time to be arrested. Then the condition of the retina and choroid, the constitutional condition of the patient, heredity, occupation, are all factors of much importance in determining the tendency to increase.

As a leading principle of treatment, Smith urged to suspect every myopia, and especially every youthful myopia, of a tendency to increase. Until time has proved it stationary, each case should be examined at stated intervals. "We can do far more important service to our short-sighted patients, if they will let us do it, by helping them to avoid a pernicious development of their disorder than by any attempt at remedial treatment after the fact."

In the British discussion A. S. Percival⁴ pointed out the tendency of the pressure of the extra-ocular muscles to cause elongation of the eyeball when the eyes were converged and turned downward as in the usual position for reading. He had the patient diminish this tendency by holding the book about on a level with the eyes for reading. E. D. Bower considered insufficient light a most important factor in devel-

¹ Ophthalmic Review, December, 1901.

² Klinische Monatsblätter f. Augenheilkunde, August, 1901.

³ Transactions of the American Ophthalmological Society, 1892.

⁴ British Medical Journal, October 19, 1901.

oping myopia, causing the book to be held too close to the eyes. A. Bronner said that monocular myopia was more apt to increase if a correcting glass was not worn, and this spoke in favor of correcting all cases of myopia.

R. D. Batten referred to the importance of the constitutional factor, and advocated the systematic education of the intra-ocular and extra-ocular muscles, best promoted by full correction glasses. E. E. Maddox remarked that when patients looked obliquely through their glasses to enable them to see better the muscular strain was bad, and the refraction should be carefully corrected. H. Eales, for those myopes whose power of accommodation was good, ordered the full correction for all purposes, even in high degrees of myopia, reserving weaker glasses for reading only for those whose accommodation was feeble. J. T. Thompson believed that it was of the utmost importance to correct myopes as early and as fully as possible, thus giving every encouragement to the holding of books at a proper distance.

But it was in the German discussion¹ that the enormous importance of the full correction of myopia was best brought out. In opening that discussion Pfalz presented three tables of cases. The first showed the increase of myopia in 25 cases that did not use glasses for near work. The average increase was 1.68 D. The second table showed the increase of myopia in 18 cases that used a partial correction for near work. The average increase was 1.28 D. The third table showed the increase of myopia among 38 cases who wore the full correction for near work. The average increase in this last group was but 0.16 D. In the three groups the patients were all young, their ages ranging from seven to nineteen years; and the average time under observation was for the first two groups 3.4 years, and for the third group 3.3 years.

The averages obtained by Pfalz indicate quite positively the value of the constant use of the full correction, but upon closer examination his tables become even more convincing. Of his cases that did not use glasses for near work and of his cases that used a partial correction for near work every one shows increase of myopia. Of the 86 eyes in these two groups there was but 1 eye that did not show an increase of myopia amounting to 0.50 D or over; but of the 76 eyes of patients using their full correction for near work the myopia remained stationary in 61, increased in 9, and diminished in 6 eyes. If we exclude 2 of these latter cases the net result was for the other 36 a diminution of myopia instead of any increase.

The paper of Pfalz was followed by one from Heine,² of Breslau, urging the full correction of myopia and the wearing of the correcting

¹ *Klinische Monatsblätter f. Augenheilkunde*, August, 1901.

² *Loc. cit.*

glasses for both distant and near vision. He, too, presented statistics strongly supporting his position. These included only young patients who had 6 D or more of myopia. Of 17 of those in whom the myopia was but partly corrected it remained stationary in 5, was somewhat progressive in 8, and in 4 was strongly progressive. Of 31 that wore for all distances the full correction the myopia remained stationary in 27 cases, increased slightly in 2, and possibly in 2 others. Heine also supports his views on theoretical grounds. This is well, because it was wholly upon theoretical grounds that the full correction of myopia was interdicted; but I have previously mentioned¹ the results of the experimental work he did in connection with Hess.

The reading of these two papers by Pfalz and Heine seemed to open the floodgates; and the discussion that ensued will make interesting reading for those who base their refusal to fully correct myopia on the German teaching of former years. As partisans of full correction appear Dor, Hess, Wicherkiewicz, Hippel, Straub, Schwartz, Lucanus, Axenfeld, Mayweg, Uhthoff, Gullstrand, Fuchs, and Krückmann; and not a voice seems to have been raised against it.

The recognition of the fact that myopia is increased by the approximation of the eyes to the book, and the prevention of it by mechanical appliances, is the subject for a monograph by E. Rolland.² Such appliances may be of value, but they are very rarely required when distinct vision is permitted by wearing the full correction.

ANATOMICAL CHANGES. The common choroidal lesions attending high myopia have been studied with the microscope by Salzman.³ He finds that in the main these lesions bear evidence of being due simply to mechanical stretching. Choroidal atrophies do occur, however, from inflammatory processes, and in connection with myopia such an origin cannot be excluded; but such observations emphasize the importance of the mere mechanical distention of the eyeball in the development of myopia.

E. Marschke⁴ has made careful measurements of ten myopic eyes; and for comparison similar measurements of six eyeballs approximately emmetropic. He finds that in myopia the stretching and thinning of the sclera is confined exclusively to the posterior segment of the eyeball—the portion lying behind the insertions of the recti muscles. Combining the results reached by these two observers it appears to be demonstrated anatomically that myopia is generally due to a simple mechanical stretching of the posterior segment of the eyeball.

¹ PROGRESSIVE MEDICINE, June, 1899, p. 424.

² Myope et Bossu, Paris, 1902.

³ La Clinique Ophthalmologique, September 25, 1901.

⁴ Klinische Monatsblätter f. Augenheilkunde, September and October, 1901.

Attention is called by Fuchs¹ to the occurrence of a limited dark circular area in the region of the macula in some cases of high myopia. Its appearance is accompanied with impairment of the vision—a central scotoma, which is at first relative, but later becomes absolute. The spot is generally lighter at the centre; at first red, but tending to become gray or white. Sometimes it leaves only an outline of pigment. Fuchs has not in any case been able to see the details of the choroid or the sclera in such an area, and, therefore, he regards it as due to exudate rather than to atrophy.

OPERATIVE TREATMENT. In reporting a case in which the removal of the lens was secured by repeated discissions in a patient over twenty years of age, C. W. Kollock² urges that in all cases discission should be performed a number of times, in order that absorption of the lens may be given a fair chance, as it entails the least danger of retinal hemorrhage or detachment. These risks and the astigmatism caused by extraction of the lens are serious offsets to the more rapid and striking results attained by extraction.

In removing the lens 50 times for myopia in patients of not over twenty-seven years, C. Frolich³ encountered detachment of the retina 3 times, and the pathological changes in the fundus were increased twice. Among the 50 cases only 23 had an “entirely normal” course. Meyerhof,⁴ in 30 cases, had 3 retinal detachments. His patients ranged from nine to thirty-eight years. In 4 other cases the improvement was but slight, and in 2 more there was subsequent deterioration after injuries.

The optical effect to be expected from the removal of the crystalline lens is still uncertain. Theoretically, by the schematic eye of Helmholtz, if wholly due to lengthening of the eyeball, it should be over 25 D. From actual experience the average amount of myopia just corrected by removal of the lens is about 20 D. Probably the values of the Helmholtz schematic eye are not the best. Treutler⁵ makes some changes in them, giving the cornea a shorter radius, 7.628 mm., and hence reducing the effect to be expected from removal of the lens. But from any average enormous variations are possible. As I have pointed out,⁶ should the myopia depend wholly upon increased curvature of the cornea, the effect produced by removal of the lens would be about the same as in an emmetropic eye; while, if the myopia depended entirely

¹ Zeitschrift f. Augenheilkunde, March, 1901.

² Ophthalmic Record, September, 1901.

³ Archives of Ophthalmology, January, 1901.

⁴ Archiv f. Augenheilkunde, xliv., 2.

⁵ Zeitschrift f. Augenheilkunde, January, 1901.

⁶ Journal of the American Medical Association, March 16, 1901.

on increased refraction by the crystalline lens, its removal would render the eye as hyperopic as the same operation would render the average emmetropic eye, no matter how high the previous myopia.

The extreme change which may be brought about when the myopia depends upon increased refraction by the lens is illustrated by a case reported by G. Keeling.¹ The removal of a congenitally dislocated lens changed a myopia of 32 D to a hyperopia of 14.5 D. On this account no report of a case of this sort can be considered complete if it does not give the actual curvatures of the cornea before and after the operation.

And no valuable judgment can be formed of the probable optical effect of such an operation unless the corneal curve has been studied; and even the refraction of the lens must be estimated to predict the effect with any certainty.

Astigmatism. OPERATIVE TREATMENT. The changes of corneal curvature produced by operations involving incision of the cornea have been pretty well studied in connection with cataract extraction and removal of the lens for myopia. These changes are so definite and so constant as naturally to suggest the production by similar means of changes of corneal curvature that would correct astigmatism previously existing. The probable effect on the astigmatism may very properly be taken into account in planning any corneal operation. By so doing I have been able to gain decided optical advantages from a necessary corneal incision. Some have gone farther and have tried corneal incisions to cure astigmatism. The galvanic cautery has been used, also, in the hope of favorably influencing the corneal curvature in conical cornea.

The latest suggestion in this matter, constituting, perhaps, a decided advance toward a practical method for the operative treatment of high astigmatism, comes from A. Breur.² He claims to have operated on 15 cases of high astigmatism with beneficial results. He thinks a resort to a perforating incision of the cornea for this purpose is unjustifiable because of the risk it involves. He employs the galvanic cautery, with which a puncture, going half-way through the thickness of the cornea, is made at each end of the most hyperopic meridian, about 1.5 mm. within the corneal limbus. To locate the puncture in just the right place, the cornea was sometimes marked previously by making a slight abrasion and staining it with fluoresceine. The cauterization would invariably heal in one or two days; and in three weeks close inspection was required to detect the scar.

The principal effect of such punctures was to produce increased curvature in the flatter meridian of the cornea. On this account the

¹ Ophthalmic Review, March, 1902.

² Lancet, June 1, 1901.

operation is especially suited to the correction of astigmatism that is chiefly or wholly hyperopic. Breuer makes much of enabling patients to go without glasses; but his report does not show that the astigmatism was completely corrected; and such a result is scarcely to be hoped for in any large proportion of cases. Yet, if patients with very high astigmatism can be saved from some of the inconveniences of wearing strong cylindrical lenses, especially when these must be placed at oblique axes, the operation may be worth doing. As with corneal incisions, the primary effect of the operation is much greater than the permanent effect.

Of course, in planning such an operation the greatest care must be taken to locate accurately the direction of the principal meridians of astigmatism to be corrected.

In this connection, an article by C. V. Majewski,¹ upon the things that influence the degree of corneal astigmatism following cataract operations, is of interest. He finds, as all have found before him, that such astigmatism diminishes with time; that the astigmatism is less the farther the wound is removed from the centre of the cornea; that it is less for incisions made with the keratome; and that it is of higher degree for very old patients or those showing advanced senile changes. Loss of vitreous during the operation seems to increase the corneal astigmatism, and, if great, renders the cornea quite irregular.

Conical Cornea. This deformity of the eyeball is most frequently brought to the oculist for the correction of the error of refraction that it causes. This is generally a high compound myopic astigmatism. At least, concave lenses commonly give the best vision; but in very many of such cases skiascopy shows that some portions of the dilated pupil are hyperopic, at least in one meridian. Mostly these hyperopic parts of the pupil are not capable of the best vision, or are situated outside the area of the contracted pupil. A case is reported, however, by H. V. Würdemann,² in which the best vision was obtained by the aid of a very strong convex sphero-cylinder. Another case is reported by J. W. Dunn;³ but the lenses required were comparatively feeble. Optically, this latter case did not differ greatly from a large class of cases, mostly hyperopic, in which the refraction, as in conical cornea, is greater near the centre of the pupil than it is near the periphery. The most pronounced conical cornea may be only an exaggeration of this common condition; but it is desirable to discriminate between the two classes of eyes. Let it be remembered, too, that the normal cornea is, to a considerable and a variable extent, conical.

¹ *Annales d'Oculistique*, August, 1901.

² *Ophthalmic Record*, September, 1901.

³ *Ibid.*, December, 1901.

Anisometropia. A series of consecutive cases of rather high anisometropia has been studied by A. Duane¹ to determine the advisability of correcting such differences of refraction between the two eyes. He concludes that in the large majority of cases, even when the difference exceeds 2 D, the full correction may be applied with success, provided the patient is warned that it will take time to get accustomed to the glasses, and that during that time they must be worn steadily. The causes of discomfort are the strength of the glasses *per se*, the unequal prismatic action of unequally strong glasses, or the co-existence of some muscular fault. In this last case the glasses, by rendering clearer the double images, make them more annoying. The statement that glasses cause trouble by producing retinal images of different sizes in the two eyes is probably fallacious.

Asthenopia. The famous definition of amaurosis, "a condition in which the patient sees nothing, and the surgeon sees nothing," might be altered to suit this condition, thus: Asthenopia, a condition in which the patient can do nothing, and the surgeon can do nothing. Under this head is grouped a residuum of disabilities unrelieved by those measures which successfully combat the same symptoms arising from certain more definite causes. Most frequently such symptoms are associated with ametropia and eye-strain; and often the correction of an error of refraction is essential to a cure, even when such a correction alone will not effect it. Symptoms may have arisen because of eye-strain, and yet the removal of that cause not relieve them. After the adjustment of glasses we must often seek for other factors that perpetuate the disability of the eyes.

Among such causes H. Pagenstecher² lays stress upon two conditions affecting the fold of transition of the conjunctiva. One consists of minute dark red swellings lying between these folds; the other of slight grayish streaks that run through these folds in various directions. Both are benefited by applications of alum crystal to this particular part. A neurotic asthenopia characterized by undue sensitiveness of the eye-ball, a spot of tenderness in the ciliary region, or hyperæsthesia about the orbit, he finds is best treated by massage. This should include forcible rubbing of the temples and forehead a minute or two at a time daily for a month or more. H. H. Seabrook³ reminds us that the patients in whom eye-strain causes headaches are neurotic, and the oculist is liable to see many headaches that do not arise from the eyes.

On the other hand, there is no more frequent or definite cause for

¹ Archives of Ophthalmology, November, 1901.

² Zeitschrift f. Augenheilkunde, May, 1901.

³ Medical Record, July 20, 1901.

neurasthenia than eye-strain. F. D. Lewis¹ claims that it may retard the whole physical development of the child, and render it more liable to contract disease. G. S. Hull² reports two striking cases sent to Southern California for the climate. One suffered from stomach trouble and headache; but the climate did not suit her until she had a low hyperopic astigmatism corrected. Then she improved rapidly. The other patient suffered from "spinal exhaustion;" also from operations on the uterine cervix and the perineum, blisters on the spine and the actual cautery. The climate began to benefit her when she commenced wearing spectacles for her ametropia. Headaches, nervous exhaustion, and a host of other conditions may arise from such widely differing causes, that to ignore even a single possible cause is to betray an imperfect grasp of the resources of medical science. It is very easy to ignore the conditions with which one does not habitually deal, the remedies one does not habitually use.

¹ American Medicine, November 16, 1901.

² Ophthalmic Record, January, 1902.

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